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RELAXATION COVERT REHEARSAL FOR ADAPTIVE FUNCTIONING IN FOURTH-GRADE CHILDREN

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In a sample of 162 fourth graders, 62 of the 70 most active and problematic—as identified by teacher ratings—were randomly assigned to relaxation/covert rehearsal, story listening, and waiting list groups. Children were evaluated before and after a 6-week treatment of 2 group sessions per week and again 4 months later, after the waiting list had also received relaxation/covert rehearsal training. Evaluations included teacher and parent ratings on the Abbreviated Behavior Scale–Form B and Coopersmith Self-Esteem Inventory; grades in mathematics, reading, spelling, and language arts; a spelling achievement test; and "blind" classroom observations and electromyographic measures. Little significant evidence was obtained for the efficacy of group relaxation/covert rehearsal, or story listening in improving adaptive functioning. Previous reports of more positive results with children's relaxation training may be spurious owing to the use of less rigorous controls.

Keywords: relaxation, covert rehearsal, adaptive functioning, story listening, children, relaxation training, hyperactivity.

Increasing awareness of the maladaptive and generalized effects of stress in children (Eisen, 1979), the definition of stress in terms of hyperarousal (Selye, 1974), and the advantages of self-regulation compared to control by external agents (Barrios & Shigetomi, 1979), have led to the use of relaxation training (RT) methods with children. The sale of RT books, audiotaped programs, and biofeedback training equipment has increased, and hundreds of school systems have implemented related

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programs (Zaichkowsky & Zaichkowsky, 1984). The efficacy of these methods, however, has not yet been clearly supported (for reviews, see Bhatara, Arnold, Lorance, & Gupta, 1979; Cobb & Evans, 1981; Luiselli, 1980; Richter, 1984).

Although many researchers have reported finding positive outcomes, methodological weaknesses abound. We have not found one article that met all of the following criteria: adequate sample size; pre-/posttreatment design; a no-treatment or waiting list group to control for extraneous influences and maturation; an adequately designed placebo or "common factors" (Critelli & Neumann, 1984) group to control for factors common to most therapy, such as therapist attention and participant expectancy; random assignment to groups; "blind" measures in which data are obtained without awareness of group membership; follow-up testing; and appropriate statistical treatment. One common statistical flaw is basing conclusions on significant improvement in one group and the lack of it in another, with no report of significant between-group differences (McNemar, 1969). Another error is failing to check for the success of randomization and to control for pretreatment differences that may occur despite randomization, for example by conducting analyses of covariance (ANCOVA). In many of the abovementioned studies, a single, narrowly defined outcome measure, often focused on treating a particular symptom (e.g., muscle tension), was used, rather than a broad spectrum of measures to assess the impact in a more meaningful way.

Most prior researchers sampled children with behavioral, learning, or somatic disorders. Despite teachers and parents complaining about nonclinical children manifesting characteristics on a continuum with these disorders, the logical value of prevention, and the use of RT in the school curriculum (Greenberg, 1977), we found only five research articles with nonclinical populations, all of which were methodologically weak. Two targeted only handwriting characteristics as the dependent variable, used relaxation and remedial writing methods, and reported less evidence of improvement for average than for poor writers (Jackson & Hughes, 1978; Jackson, Jolly, & Hamilton, 1980). Rossman and Kahnweiler (1977) reported subjective impressions of decreased stress with imagery-aided RT but used a small sample, no control groups, and no statistical tests. Zaichkowsky and Zaichkowsky (1984) used similar training and reported more improvement in an experimental class than a no-treatment class of fourth graders on two of three physiological measures of relaxation but not state or trait anxiety. They failed, however, to use random assignment of students, a common factors group, blind measures, or follow-up. The lack of a common factors group is especially damaging to their design because the experimenters administered both the physiological dependent measures and 12 treatment sessions with children lying on mats. The no-treatment

group, therefore, had less opportunity to habituate to this procedure itself. Finally, in the best controlled of these five studies, Day and Sadek (1982) found less test anxiety and general anxiety in fifth graders led by their teacher in Benson's (1975) relaxation response every morning for 6 weeks than in a group taken out of the class for a "special reading activity" (p. 352), although no differences were found at a 3-week follow-up. Their sample should perhaps not be considered representative of the general population because it was sourced from a Lebanese school near heavy military fighting and, thus, under unusual stress. No pretreatment measures were obtained, only self-report was used, the control group's leader was not the regular teacher, and its activity was not described to allow assessment of its validity as a common factors control. Finally, the control children may have felt special in a negative way when taken out of the classroom, thus increasing their anxiety relative to the relaxation group.

The need for rigorously controlled research into the efficacy of RT with both disordered and nonclinical children is, therefore, apparent. We are the first to include all of the methodological criteria listed earlier and the sixth and best controlled to use a predominantly nonclinical sample. Richter (1984) suggested that treating behaviorally disturbed children along with their nonclinical peers may enhance generalization to the classroom, and we hoped that the more disordered children included in our sample would benefit from the modelling of the less disordered ones.

Richter (1984) concluded that RT is more likely to be effective when augmented with other forms of treatment, such as positive self-statements. Thus, for maximum impact we combined RT with guided imagery for covert rehearsal (CR) of adaptive thoughts, feelings, and behaviors, using elements of Meichenbaum and Burland's (1979) cognitive behavior change and Cautela's (1982) covert conditioning procedures with children.

We used a story listening (SL) group to control for experimenter attention, eyes-closed reclining, and other common factors. Study of this particular control group seemed important for two reasons. Prior research using an SL control with disordered samples has yielded inconsistent results. Omizo (1980), Omizo and Michael (1982), and Omizo and Williams (1982) reported more improvements with RT aided by electromyographic biofeedback and guided fantasy than with SL, but Putre, Loffio, Chorost, Marx, and Gilbert (1977) found no difference between RT and SL groups. All four studies, however, had the abovementioned methodological weaknesses. Second, we suspected that SL might be more than a placebo because finding children's stories with no potentially therapeutic moral lesson is difficult. Furthermore, listening to stories could be relaxing, provide catharsis through vicarious excitement, and/or improve fantasy skills, in turn reducing the need for excessive external activity to provide stimulation.

We used live presentation of the RT/CR and stories rather than the audiotaped presentation used in most previous studies because the former has generally been found to be superior for use with adult samples (Hillenberg & Collins, 1982; Lehrer, 1982). Individual versus group presentation has not been compared in prior studies with either adults or children (Richter, 1984). We used the latter because of its economy and greater generalizability to the classroom. Further, we used a broad spectrum of measures of *adaptive functioning*, which we defined as decreased muscle tension and behavior problems and increased academic performance and self-esteem.

We included blind physiological and observational measures; self-, parent, and teacher reports; academic grades; and one standardized achievement test. On the advice of several biofeedback clinicians who work with children, frontalis muscle tension was used to measure general tension level and forearm muscle tension to tap tension related to actual gross motor movement. Using a procedure we have not found previously reported with children, both measures were taken during a relaxation baseline, a stress task, and relaxation after the stress task (i.e., recovery from stress). Behavior problems were measured by teacher and parent ratings and on-task behavior by blind classroom observations. We also measured self-esteem because it seems central to adaptive functioning and we assumed it to be both a cause and an effect of improvements in muscle tension, behavior problems, and academic performance.

Our major purpose was to determine if group RT combined with guided imagery for CR of adaptive functioning is more effective than SL and/or if both are more effective than no special treatment in enabling nonclinical and problematic children to decrease tension and behavior problems and to increase on-task behavior, academic performance, and self-esteem. Richter (1984) noted that physiological improvement has not necessarily been accompanied by behavioral improvement and that correlation between the wide variety of dependent measures used in this research area is questionable. Therefore, we also examined correlations between measures.

Method

Participants

Six public school teachers rated 162 fourth graders using the Abbreviated Behavior Rating Scale (ABRS; Conners, 1973). Parents of the 70 children with the worst ratings were sent English and Spanish versions of a letter describing the project, an information and consent form, the ABRS, and a return envelope. After phone calls to those who did not respond promptly, parental consent and ratings were obtained for 62 children. This sample averaged 12 on ABRS teacher ratings (range = 5–

26). Using a score of 15 or above as suggesting hyperactivity (see, e.g., Omizo, 1980; Omizo & Michael, 1982; Omizo & Williams, 1982) our sample included 24.8% hyperactive and 75.2% nonhyperactive children. They were randomly assigned to RT/CR, SL, and a waiting list (WL), stratifying for distribution of gender and homeroom teachers across groups. Two children moved, leaving 20 in each of the three groups for pre/post analyses. At pretest, the average age was 112 months. Of the 25 girls and 35 boys, 55% had Spanish surnames, 10 were in special education programs, and four were on medication for hyperactivity. One WL boy moved later, leaving 19 in this group for follow-up analyses.

Procedure

We conducted pretreatment evaluation, treatment for RT/CR and SL, and posttreatment evaluation in the fall semester. The WL received RT/CR in the spring semester, followed by a third evaluation (follow-up) of all groups 4 months after the second evaluation (post).

The two experimental groups, subdivided into four groups of 10 children each, completed two 30-minute sessions per week for 6 weeks. Two teams (of one man and one woman each) led them. One team led an RT/CR group on Monday/Wednesday and an SL group on Tuesday/Thursday, and the other team led an SL group on Monday/Wednesday and an RT/CR group on Tuesday/Thursday to control for meeting days and therapist characteristics. Within each subgroup, the woman and man alternated primary leadership each session. The two authors served as the female leaders and two graduate students as the male leaders. The first author trained and supervised the leaders, all of whom had previous experience in working with children. The WL was later also subdivided into two groups of 10 each, with a man and woman leading each group in RT/CR.

Groups met during the last class period of the school day in the school's two music rooms. Children were told that the purpose of our project was to study ways to help children "relax, be in control of themselves, and feel good about themselves." Using an American Indian theme and sign language that one leader modeled, children were induced to sit cross-legged at the beginning of each session on a circle of mats on the floor and then recline with eyes closed as the other leader read the RT/CR script or the SL story.

The first few sessions for the RT/CR groups elicited the children's awareness of changes in breathing and muscle tension that accompany "scared, nervous, uptight" feelings and led them in regulated breathing, progressive muscle relaxation, and covert positive self-talk. Imaginary trips were introduced to provide another relaxation skill and a method of quiet self-entertainment, and to develop imagery skills for later sessions. The relaxation procedures were then abbreviated to devote more time to

"practicing things in your mind," such as working despite distractions, finishing tasks, delaying gratification, seeking attention appropriately, and handling negative feelings (scared, mad, and sad). We included ways to handle others' anger as well as one's own and to negotiate compromise. These techniques involved identifying the problem, brainstorming alternatives, evaluating consequences, and choosing an appropriate behavior with positive self-talk and consequences. Well-rehearsed scripts were used and are available upon request, and the sessions were taped.

The SL groups were read age-appropriate stories, such as Indian legends, fairy tales, and animal stories. We chose those that seemed neither particularly relaxing, arousing, nor moralistic. (A bibliography is available from the authors upon request.)

Children were encouraged to practice daily. They received notebooks for writing their own stories (SL groups) or recording experiences when practicing relaxation and covert rehearsal (RT/CR groups). Drawings could also be used for illustration. At the end of each session, leaders complimented this homework and awarded a sticker (animals, flowers, etc.) on a calendar in the notebook for each daily entry.

Children were told they would receive a surprise at the end of each session if they had been still and quiet, and a big surprise made of all the little ones at the end of the project. Trinkets symbolizing each session's theme (RT/CR) or story (SL), with approximately equal value and appeal, were given and kept in a large envelope with the child's name. At the last session, mobiles were constructed from these trinkets and taken home to avoid comparisons and envy from the WL group. In only a few instances was a trinket withheld, and each time the child earned both it and the next one in the next session. Leaders verbally rewarded those who were still and quiet and began giving them extra stickers (stars, happy faces, etc.).

Using an Autogen 1700 Electromyograph (EMG) and a hand-built electronic timing device, two teams (a woman and a man each), who were blind to group assignment, conducted individual EMG evaluations in a small room at the school. After training on pilot children and using a rehearsed script for standardization, they explained the equipment and procedures in simple, reassuring terms as they attached electrodes to the frontalis muscle and to the preferred writing forearm resting on the arm of a desk chair. They had the child tense and relax the forehead and arm and wiggle the fingers to demonstrate the meter and sound fluctuations and be sure they understood the concept of muscle relaxation. With the sound off and the meter blocked from the child's view, they then recorded electrical potential in microvolts, averaged over two 2-minute intervals (alternating the order of forearm and forehead for every other child) under each of three conditions: "relaxing as much as you can" (baseline), "staying as relaxed as you can and counting aloud by threes" (stress), and "relaxing

again as much as you can" (recovery from stress). The team explained the stress task until the child demonstrated adequate understanding and showed how counting on the fingers would interfere with forearm relaxation. The two 2-minute averages were taken for better sampling and later averaged to yield one value for each of the three conditions.

Using stopwatches and observation forms on clipboards, five other assistants, who were blind to group assignment, each observed 12 children in their regular classrooms. Sitting quietly at one side of the room for the first 5 minutes of each observation period to accustom the class to their presence, the observer then recorded every 15 seconds for 10 minutes (40 observations) whether or not the child's behavior was adaptive—that is, consistent with the task assigned by the teacher for that time, e.g., sitting quietly at their desk facing the teacher when she was presenting material or having pencil to paper or eyes on books when these were assigned. Each child was observed on 3 days at different times of the day for better sampling of behavior. Percentages of appropriate behavior out of these 120 observations were obtained for each child. Before all three evaluations, classroom observers trained on nonparticipating, anonymous children in the classroom to reach 90% (36 of 40 observations) interrater agreement on a given child.

Measures

At all three evaluations, teachers completed the ABRS and also sent and received in sealed envelopes the ABRS for the parents' ratings. (The same parent was asked to complete this each time.) This scale has been reported to be the most widely used teacher-rating scale for research on hyperactivity (Sandoval, 1977), and has good reliability and validity (Zentall & Barack, 1979). It consists of 10 items dealing with excess activity and other behavior problems observable in nonhyperactive as well as hyperactive children, which are rated on a 4-point Likert scale.

Another man-and-woman team, who were blind to group assignment, gave the Coopersmith (1967, 1975) Self-Esteem Inventory–Form B (Revised Short Form) to four groups of 15 children each. At the second (post) evaluation only, they also gave the spelling portion of an achievement test, the California Comprehensive Test of Basic Skills, Form 5, Level 1 (California Test Bureau, 1971). Children's national percentile scores were available on this same test administered by teachers at the end of the spring (follow-up) and from the end of the previous year (pre).

Grades in mathematics, reading, spelling, and language arts were obtained for three 9-week report periods. Unfortunately, the first period (pre) ended half-way through the first treatment period. The second grading period (post) then ended 6 weeks after this treatment and before the WL received treatment. The third grading period (follow-up)

overlapped with the WL group's 6-week treatment, ending 3 weeks thereafter. We converted letter grades to numerical ones by arbitrarily letting A+ = 95, A = 92, etc.

Self-esteem, class observation, and EMG measures were completed at post- and follow-up evaluations in the same manner and, as much as schedules allowed, at the same day of the week and time of day by the same assistants as at pretest. Each assistant or assistant team obtained these measures on children randomly assigned to them from all three groups but were blind to the children's group assignment and were asked not to discuss the children with teachers, group leaders, or each other. Except for the WL, teachers were also unaware of group membership.

Results

Owing to some significant pretest differences in the dependent variables in spite of randomization, we performed ANCOVA on posttest and follow-up means with pretest scores as covariates. To study the concurrent validity of and relationships between the variables, Pearson correlation coefficients were obtained at pre- and posttest for all combinations of teacher and parent ratings, classroom observations, self-esteem, and the six EMG measures. Two-tailed tests were used throughout.

Check for Confounds

Analyses of variance revealed no significant difference across groups in terms of age or the number of reported home practice sessions (M = 10 per child over the 6-week training period). Chi-square analyses revealed no significant difference across groups in terms of gender, race, distribution across homeroom teachers, participation in special education programs, or taking medication for hyperactivity.

Behavior Problems

The groups did not differ significantly at either posttest or follow-up on teaching ratings, parent ratings, or the classroom observation measure.

Self-Esteem

At posttest, the difference across groups approached significance, with adjusted means of 15.96, 15.64, and 13.33 for RT/CR, SL, and WL respectively, $F(2, 56)$ 2.66, $p < .08$. No significant difference appeared at follow-up.

Forearm Muscle Tension

At posttest, the difference across groups on baseline tension approached significance, with adjusted means of 5.42, 4.95, and 2.59 for RT/CR, SL, and WL, respectively, $F(2, 54) = 2.54$, $p < .09$. Groups did not differ

significantly during the stress task, but did differ on the recovery-from-stress measure, with adjusted means of 4.27, 4.90, and 2.42 for RT/CR, SL, and WL, respectively, $F(2, 54) = 4.47$, $p < .02$. No significant differences appeared at follow-up.

Frontalis Muscle Tension

Differences across groups were not significant on any of the three measures at posttest or follow-up.

Grades

At posttest, groups differed significantly in spelling grades, with adjusted means of 80.0, 84.6, and 80.3 for RT/CR, SL, and WL, respectively, $F(2, 55) = 4.04$, $p < .03$. Differences approached significance in language arts grades, with adjusted means of 80.4, 83.4, and 79.7 for RT/CR, SL, and WL, respectively, $F(2, 55) = 2.48$, $p < .10$. No significant differences appeared in mathematics or reading grades at posttest, or any of the four grade areas at follow-up. Regarding the spelling achievement test, groups did not differ significantly at posttest or follow-up.

Correlations Between Measures

Teacher ratings did not correlate significantly at pre- or posttest with parent ratings, classroom observations, self-esteem, or the six EMG measures. Parent ratings did not correlate significantly with the EMG measures. Parent ratings did correlate with self-esteem scores at pretest, $r(55) = -.29$, $p < .02$, but not at posttest. Parent ratings also correlated with classroom observations at pretest, $r(54) = .18$, $p < .09$, and posttest, $r(55) = .22$, $p < .05$. Classroom observations approached a significant correlation with only one other measure: that for frontalis muscle tension under the stress condition at pretest, $r(55) = .18$, $p < .10$. Self-esteem correlated positively with five of the six EMG measures at pretest, $rs(56) = .20–.31$, $ps = .008–.06$, and with the three for forearm at posttest, $rs(58) = .16–.23$, $ps = .04–.10$. All correlations between the six EMG measures at both pre- and posttest were positive and significant. For the stress condition, coefficients tended to be smaller, $rs(58) = .27–.92$, $ps = .02–.001$, than those for baseline and recovery-from-stress, $rs(58) = .75–.95$, $ps < .001$.

Discussion

We did not find support for the efficacy of either RT/CR or reclining SL in improving the adaptive functioning of nonclinical and problematic fourth graders. Of 30 ANCOVA, just three were significant at $p < .10$. Further, although we did not conduct a posteriori analyses of these few barely significant results and although RT/CR and SL participants tended

to have more self-esteem and SL to have better spelling and language arts grades than WL participants, they tended to be more tense on two of 12 EMG measures than WL participants were. Furthermore, only these two of the barely significant five results were completely blind measures, and even these five differences had disappeared by the 4-month follow-up.

Comparing our study to the many others on RT with children (see reviews cited and articles critiqued in our introduction) is difficult because of differences in samples, interventions, and dependent variables. The type and number of treatments and most of the dependent variables were, however, comparable enough for us to suspect that the results obtained in the many studies that reported more positive outcomes than ours with either disordered or nonclinical children, were spurious owing to the methodological weaknesses we discussed in the introduction.

Our results are consistent with those of the only two previous studies that were well controlled, i.e., that met most of the methodological criteria we listed except for adequate sample size. (Both had only 4–5 children per group.) Using a predominantly hyperactive sample in a study otherwise almost identical to the present one, Fling, Safady, Schwausch, and Wright (1983) found results that were nonsignificant but quite consistently in the expected directions. Vacc and Greenleaf (1980) reported no significantly greater change in either anxiety or behavior ratings for emotionally handicapped children assigned to RT or RT/CR than for those in quiet activities placebo or no-treatment groups. (In addition to having an adequate sample size, the only other two criteria the latter study failed to meet, i.e., blind measures and follow-up testing, were not too critical because of their nonsignificant results.)

The role of stress and presumably consequent muscle tension in children's maladaptive functioning has yet to be clearly demonstrated. Braud's (1978) report of higher muscle tension in hyperactive than in nonhyperactive children has often been cited as a rationale for RT. We found, however, no significant correlations among any of our six EMG measures and the behavior measures obtained from teachers, parents, and classroom observers. Furthermore, we found a tendency for more appropriate classroom behavior to correlate with greater frontalis muscle tension under stress. Some tension under stress can actually be adaptive, such as concentration while counting aloud by threes in our stress task.

We would be remiss not to mention the possibility that RT may be contraindicated for hyperactive children, as suggested by the underarousal theory of hyperactivity (Gargiulo & Kuna, 1979) and by some minimal evidence of decreased hyperactivity associated with increased EMG level (Whitmer, 1977) and increased hyperactivity with decreased EMG level (Baldwin, Benjamin, Meyers, & Grant, 1978). Our RT/CR group showed higher EMG levels than the WL group did on two of 12 measures (2

muscles × 3 conditions × 2 time periods). Lying still with eyes closed in a group appeared almost impossible for the hyperactive participants in our sample, at least until the guided fantasy or story was underway. This may relate to a recent report of a paradoxical tendency for some individuals to become more tense with RT (Heide, 1985). We recommend caution, therefore, in research and treatment using RT for hyperactive participants.

Another finding that may relate to Heide's (1985) observations is the observed correlation between self-esteem and muscle tension on eight of the 12 coefficients calculated. This may be explained in terms of social desirability. Children who rate themselves high on self-esteem may become tense through trying too hard to relax in order to please the experimenter and do what is expected. As Heide suggested, this may backfire because relaxation implies a passive attitude.

We must question the validity of the behavior measures because of the lack of expected correlations between them. Teacher and parent ratings may not have correlated because of differences in behavior at school and at home, but teacher ratings also failed to correlate with classroom observations, and parent ratings had a low correlation with classroom observations in the opposite direction of that expected. That is, worse parent ratings correlated with more on-task behavior in the classroom. Development of more refined measures of behavior is sorely needed.

Some evidence was obtained, however, that parent (but not teacher) ratings of problem behaviors correlated negatively with self-esteem, as expected. Low self-esteem may contribute to behavior problems and vice versa, as well as other variables contributing to both. Children whose parents perceive them negatively may also perceive themselves negatively.

Our EMG measurement innovations seem worthy of further exploration. The stress manipulation was apparently effective, in that muscle tension while counting aloud by threes was quite consistently greater than that while relaxing under baseline and recovery-from-stress conditions. The observation of several clinicians that, although frontalis muscle tension is the usual measure of general tension for adults, forearm tension seems to be more appropriate for children also gained some support, such that our only group differences in tension appeared in the forearm measures.

No conclusions can be drawn on the value of reclining, eyes-closed SL as a common factors control or as an effective treatment in itself. Although the RT/CR group tended to have slightly higher self-esteem than the SL group, the latter tended to have higher spelling and language arts grades. Further work is needed to resolve the discrepancy discussed earlier between the studies by Omizo and colleagues (Omizo, 1980; Omizo & Michael, 1982; Omizo & Williams, 1982) and that by Putre et al. (1977).

In summary, little evidence was obtained that group RT/CR or SL help children to decrease muscle tension and behavior problems and increase

on-task behavior, academic performance, and self-esteem. The more positive results gained in the many relaxation studies with disordered children and the few with nonclinical populations may be spurious owing to their less rigorous methodology. The continued sale of materials and equipment for children's RT and its use in clinical and educational settings, therefore, cannot yet be justified on the basis of well-controlled research. To demonstrate the efficacy of RT methods with children, more frequent and perhaps more individualized sessions over a longer period of time with teacher- and/or parent-led practice may be required.

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