

ACADEMIC PERFORMANCE AMONG MIDDLE SCHOOL STUDENTS AFTER EXPOSURE TO A RELAXATION RESPONSE CURRICULUM

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The relationship between exposure to a relaxation response curriculum and academic achievement was examined among middle school students. Teachers were trained in how to teach relaxation response exercises and self-care strategies to their students. In addition, trainers modeled for teachers how to teach relaxation and self-care strategies to the students in the classroom. Four measures of academic outcomes were analyzed: grade point average, work habits, cooperation, and attendance. Students who had more than two exposures to semester long classes in which teachers had been trained in the relaxation response curriculum had higher grade point averages, work habits scores and cooperation scores than students who had two or fewer exposures. In addition, students who had more exposures to the relaxation response curriculum showed an improvement in academic scores over the course of a 2-year period.

The relaxation response as described by Benson (1975) consists of the physiologic effects of engaging in a simple two-step procedure: (a) focusing on a word, sound, phrase, prayer, image or physical activity and (b) maintaining a passive attitude toward distracting thoughts. The relaxation response is the physiological opposite of the arousal, or stress, response. Specifically, the physiological arousal associated with stress, labeled the fight-or-flight response, is characterized by increases in metabolism, heart rate, blood pressure, and rate of breathing. The counterpart of this stress or fight-or-flight response, the relaxation response, is physiological relaxation characterized by decreases in metabolism, blood pressure, rate of breathing and heart rate as well as slower brain waves

(Kasamatsu & Hirai, 1966). Various cultural practices such as meditation and yoga, as well as progressive relaxation and autogenic training are techniques that evoke the physiologic changes of the relaxation response (Benson, Beary, & Carol, 1974). The immediate changes in central and peripheral nervous system activity resulting from the relaxation response are consistent with decreased sympathetic nervous system activity (Beary & Benson, 1974; Jacobs, Benson, & Friedman, 1996). Continued practice results in more lasting changes that counteract the hormonal changes induced by stress (Hoffman et al., 1982).

In addition to its physiological benefits, the relaxation response has been shown to produce psychological benefits. Whereas the stress response is accompanied by increased anxiety, depression and anger, the relaxation response is associated with feelings of calmness and control (Benson et al., 1978). Trzcieniecka-Green and Steptoe (1994) conducted a controlled study that evaluated a 12-week relaxation-based stress management program. Seventy-eight patients who had coronary artery bypass surgery, coronary angioplasty, or myocardial infarction participated in the study. The study demonstrated that the intervention was effective in reducing chest pain as

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well as anxiety and depression. Improvements were also reported in social activity, activities of daily living and quality of interactions.

Because of its well-documented physiological and psychological effects, the relaxation response is now commonly elicited as an adjunctive treatment for a variety of medical conditions caused or exacerbated by stress (Domar, Friedman, & Benson, 1992; Friedman, Stuart, & Benson, 1992; Friedman, Myers, Krass, & Benson, 1996). These include anxiety, mild and moderate depression, hypertension, premenstrual syndrome, insomnia and many forms of pain. Caudill et al. (1991) studied 109 chronic pain patients who participated in a behavioral group intervention that included relaxation response training. All participants were patients who were members of an HMO. The average duration of pain among the participants was 6.5 years. At the end of the 10-week intervention period, participants in the group reported decreases in both pain severity and in negative psychological symptoms including anxiety, depression, and hostility as well as increased activity and less disability.

Although the generally positive effect of regular elicitation of the relaxation response has resulted in its widespread acceptance in both medical practice (Stapleton & Fine, 1988; NIH Technology Assessment Panel on Integration of Behavioral and Relaxation Approaches Into the Treatment of Chronic Pain and Insomnia, 1996) and psychotherapy (Task Force Report of the American Psychiatric Association, 1989), its incorporation into academic settings as a means of contributing to positive psychological and behavioral changes has been limited. The rationale for examining the effects of relaxation response training on students is based on the results from adults who have regularly elicited the relaxation response to counteract the negative psychological symptoms associated with stress.

Our first education study using a relaxation response curriculum was conducted on a group of high-school sophomores prior to, during and following a single academic year (Benson, et al., 1994). In a randomized, crossover experimental design, students were either exposed to a standard health curriculum or a curriculum based on elicitation of the relaxation response in the fall semester of the school year. Then, in the following spring semester, those students who had received the standard health curriculum in the fall were crossed over into the relaxation response cur-

riculum. Exposures to the relaxation response curriculum, but not the control curriculum, resulted in a significant increase in self-esteem and a tendency toward greater internal locus of control scores. Teacher observations indicated a high degree of student acceptance of relaxation response training.

Most of the interventions intended to change psychological or behavioral variables in students have not emphasized the acquisition of self-regulatory skills and have not focused on academic performance. Better self-control has occasionally been reported as an outcome measure in educational studies (Danish, 1997), but the reported increases in self-control do not appear to be the result of interventions such as focused relaxation that are directly targeted at self-control or self-regulation. Although training in relaxation has been included in programs designed to help reduce the frequency of inappropriate behaviors (Caplan et al., 1992) no program has investigated the elicitation of the relaxation response as the primary component of the curriculum. In the present study, we focused our attention on academic performance, which included grade point average, work habits, cooperation and attendance, of Los Angeles middle school students.

METHOD

Participants

The participants in the study were teachers and students at the Horace Mann Middle School in South Central Los Angeles. The middle school is composed of sixth, seventh and eighth grades. The number of students in the school averaged 1,753 during the 3-year intervention period. The demographics of the students were 64% African American; 35% Hispanic; 1% other. The school was selected after consultation with and the approval of the Los Angeles Unified School District. The principal of the school had expressed a willingness to cooperate with the study and the teaching staff was interested in participation as well.

Procedure

Middle school students were exposed to a relaxation response curriculum over a 3-year period, beginning in the Fall of 1994 and ending in the Spring of 1997. The relaxation response curriculum was introduced into the classroom in a two-step fashion by the

staff of the Mind/Body Medical Institute (M/BMI). First, teachers were recruited to participate in a specially developed training program in the summer before the beginning of the fall semester. Participation in the training program was voluntary. M/BMI personnel trained teachers to teach relaxation response skills to their students and to use relaxation response skills to reduce their own stress. Secondly, beginning in the second semester of the first year, M/BMI trainers directly modeled for teachers in the classroom how to instruct students in the use of relaxation response strategies. The classroom training sessions occurred once per week for 5 weeks. Teachers were encouraged to practice the relaxation response skills with students at times other than when the trainer was present.

The relaxation response curriculum consisted of the following core elements: education on the physiology of stress; identification of personal stressors; elicitation of the relaxation response using a mental focus or diaphragmatic breathing while developing a passive attitude toward distractions; “mini-relaxations” consisting of strategies to elicit the relaxation response quickly in response to stress; body awareness and stretching exercises; and “mindfulness” training. Mindfulness training includes cultivating attentive awareness of the activity one is engaged in and then continually drawing the attention back to the activity when distractions occur.

Measures

The outcome measures for the study were grade point average (GPA), work habits, cooperation, and attendance. These measures were collected at the end of each semester from the students’ report cards. For GPA, the average score was calculated for all classes completed during a semester. Letter grades for individual classes were assigned numbers as follows: “A” - 4, “B” - 3, “C” - 2, “D” - 1 and “F” - 0. Only full letter grades were recorded. Work habits and cooperation scores were subjectively determined by the teachers and graded on a 3-point scale: 2 - excellent, 1 - satisfactory, and 0 - unsatisfactory. Attendance was calculated as the percent of the days enrolled. The Los Angeles Unified School District collected data from the report cards in the standard fashion. The names of students were removed and identifying numbers substituted. In this way, the complete confidentiality of

the students was maintained. The data were then electronically transferred from the computers of the Los Angeles Unified School District to M/BMI for analysis.

Analyses

Two series of analyses were conducted. The first series was to determine if there was a relationship between the amount of exposure to the relaxation response curriculum and the four outcome measures: GPA, work habits, cooperation, and attendance. The second series was to examine whether the amount of exposure to the relaxation response curriculum had an effect on the outcome measures over time.

First Series

Analyses of covariance (ANCOVA) were conducted for each of the outcome measures, examining the effect of level of exposure to the relaxation response curriculum. The spring semester grades in each of the 3 years were used as dependent measures. In the first year (1994-1995 academic year), students’ scores were divided into groups of those who had received 0, 1, 2, or more than two exposures to semester-long classes taught by teachers trained in the relaxation response curriculum over the course of the entire school year. The dependent variables were the four outcome measures obtained from the spring 1995 report card. The Fall 1994 semester scores were used as covariates. The analyses were repeated on the Spring 1996 grades and Spring 1997 grades using the fall and spring semester grades of the previous years, respectively, as covariates.

As more students were exposed to the relaxation response curriculum in the second and third years of the intervention (1995-1996 and 1996-1997 academic years), student scores were divided into groups of those who had received zero, one-two, three-four, and more than four exposures. This was done to obtain more evenly distributed sample sizes among the groups. Exposures occurring in previous years were not counted when determining groups in the second and third years’ analyses. Thus, for the Spring 1996 analyses, students were grouped according to the sum of exposures occurring during Fall 1995 and Spring 1996. For the Spring 1997 analyses, students were grouped according to the sum of exposures occurring during Fall 1996 and Spring 1997.

Second Series

RESULTS

To determine whether there was a change in the outcome measures over time as a result of exposure to the relaxation response curriculum, analyses of covariance (ANCOVA) were conducted on scores in each of the outcome measures from Spring 1995 and Spring 1996, using the Fall 1994 scores as covariates. The analysis was repeated on the spring semester scores in 1996 and 1997 using the Fall 1995 scores as covariates. The scores of students were divided into groups who had received zero, one-two, three-four, or more than four exposures to semester-long classes taught by teachers trained in the relaxation response curriculum. Students were grouped according to the sum of exposures that they received in the fall and spring of the corresponding second year. Thus, for the ANCOVA comparing the scores of Spring 1995 and Spring 1996 semesters, the students were grouped by summing the number of exposures that they received in the 1995-96 academic year. For the ANCOVA on the scores from spring semesters of 1996 and 1997, the number of exposures was calculated by summing those that occurred in the 1996-1997 school year. The effect of level of exposure to the relaxation response curriculum was examined.

First series

The first series of analyses to determine the effect of level of exposure to relaxation response curriculum on the four outcome measures demonstrated that more exposure to the relaxation response curriculum was associated with higher scores in GPA, work habits and cooperation. Students' scores were grouped according to the amount of exposure to semester-long classes taught by teachers trained in the relaxation-response curriculum (First-year groups: 0, 1, 2, >2 [Table 1]; Second- and Third-year groups: 0, 1-2, 3-4, >4 [Tables 2 and 3, respectively]). Although differences among the groups on each of the outcome measures were not significant in all cases, adjusted means appeared to follow a somewhat consistent pattern in that higher scores were associated with more exposures to the relaxation response curriculum and lower scores were associated with fewer exposures. In all three semesters analyzed, students with more than four exposures to the relaxation response curriculum had significantly higher GPAs than those who had no exposures. The relationship of higher scores with more exposures and lower scores with fewer exposures is more clearly evident in the second year (1995-96 academic year)

Table 1
Effect of Exposure to the Relaxation Response Curriculum – Spring 1995

Spring 1995 Adjusted Means					
Group	Sum of Exposures to '94-'95 Relaxation Response Curriculum	Grade Point Average	Work Habits	Cooperation	Pct. Attendance
1	0 (n=467)	2.05	1.01	1.21	88.01
2	1 (n=384)	2.08	1.01	1.20	87.36
3	2 (n=217)	2.07	0.99	1.19	87.65
4	>2 (n= 81)	2.25	1.07	1.26	87.16
<i>p</i> value for ANCOVA		.08	.37	.39	.68
<i>p</i> values for pair-wise comparisons					
		1 < 2	1 < 2	1 > 2	1 > 2
		1 < 3	1 > 3	1 > 3	1 > 3
	0.01	1 < 4	1 < 4	1 < 4	1 > 4
		2 > 3	2 > 3	2 > 3	2 < 3
	0.02	2 < 4	2 < 4	2 < 4	2 < 4
	0.02	3 < 4	3 < 4	3 < 4	3 > 4

(Table 2) and third year (1996-97 academic year) (Table 3) for three of the outcome measures. Students exposed to more than two classes incorporating the relaxation response had significantly higher GPA, work habits and cooperation scores compared to those with zero exposures. The intervention did not appear to have an effect on attendance (Tables 1 and 2) until the third year (Table 3), when the pattern became evident. In several cases the adjusted means follow a "dose response" pattern across the different levels of exposure.

Grade Point Average. For grade point average in Spring 1995 (Table 1) the scores ranged from 2.05 for the zero exposure group to 2.25 for the group exposed to more than two classes incorporating the relaxation response. Post hoc analyses revealed that the differences between the zero exposure group and the greater than two-exposure group was significant ($p < .01$). In Spring 1996, (Table 2) mean GPA ranged from 1.78 to 2.24. Again the highest exposure group had a significantly higher GPA than the zero exposure group ($p < .001$). There were also significant differences between the zero exposure group and the groups receiving one-two exposures ($p < .002$) and three-four exposures ($p < .001$). In spring 1997 (Table 3) the differences between the zero exposure

group and the more than four exposure group was also significant ($p < .03$).

Work Habits. For work habits in the Spring of 1995 (Table 1), the group effect was not significant; the scores ranged from 1.01 for those who received zero exposures to 1.07 for those who received >two exposures. In spring 1996 (Table 2), the group effect was significant, with scores ranging from 0.90 for the zero exposure group to 1.12 for the > four exposure group ($p < .001$). And in the third year, Spring 1997 (Table 3), there was again a significant group effect ($p < .05$). Scores ranged from 0.95 for the zero exposure group to 1.10 for the >four exposures group. Post hoc comparisons revealed a significant difference between these two groups ($p < .01$).

Cooperation. For cooperation in Spring 1995 (Table 1), scores ranged from 1.21 for the zero exposure group to 1.26 for the >four exposures group. The group effect was not significant. However, in the following year, spring 1996 (see Table 2), the group effect was significant ($p < .0001$). This may have been due in part to the addition of another semester's scores as covariates. Scores ranged from 1.06 for the zero exposure group to 1.29 for the >four exposures group. Post hoc comparisons revealed a significant difference between these two groups ($p < .001$). Finally, in

Table 2
Effect of Exposure to the Relaxation Response Curriculum – Spring 1996

Spring 1996 Adjusted Means					
Group	Sum of Exposures to '95-'96 Relaxation Response Curriculum	Grade Point Average	Work Habits	Cooperation	Pct. Attendance
1	0 (n=132)	1.78	0.90	1.06	89.48
2	1-2 (n=159)	2.02	0.98	1.13	90.18
3	3-4 (n=137)	2.28	1.11	1.28	89.87
4	>4 (n=114)	2.24	1.12	1.29	88.90
Group effect <i>p</i> value		.0001	.0001	.0001	.62
<i>p</i> values for pair-wise comparisons					
	1 < 2	.002	1 < 2	1 < 2	1 < 2
	1 < 3	.001	1 < 3	.001	1 < 3
	1 < 4	.001	1 < 4	.001	1 > 4
	2 < 3	.001	2 < 3	.001	2 > 3
	2 < 4	.006	2 < 4	.001	2 > 4
	3 > 4		3 < 4	3 < 4	3 > 4

Spring 1997 (Table 3) there was a significant group effect ($p < .005$). Scores ranged from 1.07 for the zero exposure group to 1.25 for the three-four exposures group and 1.18 for the >four exposures group. Post hoc comparisons revealed a significant difference between the zero exposures group and both the three-four exposures group ($p < .001$) and the >four exposures group ($p < .04$).

Attendance. Attendance scores did not follow a similar pattern as the other outcome measures (Tables 1 and 2) until the third year, Spring 1997 (Table 3) in which there was a dose response pattern and a significant group effect ($p < .02$).

Second Series

The second series of analyses consisted of ANCOVAs conducted on consecutive 2-year periods to determine the effect of exposure to the relaxation response curriculum over time.

Changes from Spring 1995 to Spring 1996

Grade Point Average. For grade point average (Table 4), a significant group-by-time interaction was found ($F = 18.89, p < .0001$). Adjusted means revealed

that students with two or more exposures showed an increase in GPA between 1995 and 1996 and those with zero to two exposures exhibited a reduction in GPA during the same time period.

Work Habits. The results of the ANCOVA for work habits were similar to GPA (Table 4) with a highly significant group-by-time interaction ($F = 12.44, p < .0001$). Again, adjusted means revealed a similar pattern to that of GPA (Table 4); groups with minimal exposure (zero, one-two) showed a decrease in work habit scores from Spring 1995 to Spring 1996 and those with more exposures (three-four, >4) showed an increase in work habits scores.

Cooperation. The ANCOVA on cooperation scores again yielded a highly significant group-by-time interaction (Table 4) ($F = 19.58, p < .0001$). The scores followed the same pattern as those of GPA and work habits.

Attendance. The ANCOVA failed to reveal a significant group-by-time interaction in school attendance. Adjusted means showed that attendance scores increased slightly in the groups exposed to zero, one-two, or three-four relaxation-response classes and decreased slightly among students with more than four exposures (Table 4).

Table 3
Effect of Exposure to Relaxation Response Curriculum – Spring 1997

Spring 1997 Adjusted Means						
Group	Sum of Exposures to '96-'97 Relaxation Response Curriculum	Grade Point Average	Work Habits	Cooperation	Pct. Attendance	
1	0 (n = 48)	1.98	0.95	1.07	82.02	
2	1-2 (n = 169)	2.09	1.06	1.20	86.00	
3	3-4 (n = 229)	2.20	1.10	1.25	88.66	
44	>4 (n = 149)	2.22	1.10	1.18	88.89	
Group effect p value		.07	.05	.005	.02	
p values for pair-wise comparisons						
	1 < 2	1 < 2	0.03	1 < 2	0.01	1 < 2
	1 < 3	0.04	1 < 3	0.01	1 < 3	0.001
	1 < 4	0.03	1 < 4	0.01	1 < 4	0.04
	2 < 3		2 < 3		2 < 3	
	2 < 4		2 < 4		2 < 4	
	3 < 4		3 > 4		3 > 4	0.45
					3 < 4	

Changes from Spring 1996 to Spring 1997

The results from the analyses of covariance on the Spring 1996 and Spring 1997 scores (Table 5) showed that the pattern of change was similar to that observed from the first to the second year. However, the group-by-time interaction did not reach significance. Adjusted means revealed that GPA increased among those students with more than four exposures (adjusted means: 2.15 to 2.22) to the relaxation response curriculum and decreased among students with no exposures (adjusted means: 2.06 to 1.97). The pattern was similar for work habits; scores for those with more than four exposures increased (1.02 to 1.08), while those with zero exposures decreased (1.00 to .96). For cooperation, the scores paralleled those of GPA and work habits. There was a significant group-by-time interaction for attendance scores from 1996 to 1997 ($p < .0003$). Post hoc analyses revealed that attendance scores decreased among all the groups in Spring 1997 and decreased significantly for the group exposed to three-four classes incorporating the relaxation response ($p < .01$).

DISCUSSION

The results from this study provide evidence that a relaxation response intervention can help to improve the academic performance of middle school children. Adolescents exposed to the relaxation response curriculum obtained higher grade point averages and scored higher in work habits and cooperation than those students not exposed or minimally exposed. A critical level of more than two exposures to semester-long classes incorporating the relaxation response curriculum appeared to be necessary to produce these results. In addition, the results show that there was a benefit to continuing the curriculum over several years. A second series of analyses showed that grades increased for students who had more exposure.

These results are important because the curriculum was successful with students who lived in an economically disadvantaged neighborhood. Children in such neighborhoods are exposed to a high degree of violence (Duncan, 1996). Gladstein, et al. (1992) found that inner-city children were more likely to know victims of violence and to be witnesses to murders, rapes, and other types of assaults compared to children from middle- to upper-class neighborhoods.

Table 4

Changes in Academic Outcomes as a result of Varying Levels of Exposure to Relaxation Response Curriculum – Spring 1995-1996

Adjusted Group Means									
Group	Sum of Exposures to '95-'96 Relaxation Response Curriculum	Spring 1995 GPA	Spring 1996 GPA	Spring 1995 Work Habits	Spring 1996 Work Habits	Spring 1995 Cooperation	Spring 1996 Cooperation	Spring 1995 Attendance	Spring 1996 Attendance
1	0 (n = 132)	2.28	1.82	1.10	0.93	1.32	1.07	89.13	89.31
2	1-2 (n = 159)	2.34	2.07	1.11	.98	1.32	1.13	90.73	90.75
3	3-4 (n = 137)	2.13	2.22	1.06	1.09	1.26	1.27	89.32	89.77
4	>4 (n = 114)	2.08	2.19	1.02	1.10	1.23	1.27	88.44	88.42
Group effect p value			.0001		.0001		.0001		NS
<i>p</i> values for pair-wise comparisons									
			1 < 2	0.02		1 < 2		1 < 2	
			1 < 3			1 < 3		1 < 3	
			1 < 4			1 < 4		1 > 4	
			2 < 3			2 < 3		2 > 3	
			2 < 4			2 < 4		2 > 4	.005
			3 < 4			3 > 4		3 > 4	

Repeated exposure to violence can lead to the development of psychological problems such as depression and posttraumatic stress disorder (Pynoos et al., 1987). The relaxation response curriculum helps students to cope with various stresses in their lives, and was not focused solely on academic stress. Students were encouraged to practice the exercises inside and outside of the classroom. Duncan argues that children are better able to cope with living in violent neighborhoods if they have an internal locus of control and a sense of self-efficacy. A relaxation response curriculum similar to that used in this study has been shown to increase reports of self-esteem and a tendency toward greater internal locus of control in high school students (Benson, et al., 1994).

Strategies to elicit the relaxation response are simple to learn and can be easily incorporated into daily life and thus may be ideal for students who are resistant to commit to more complex programs. The relaxation response curriculum teaches students self-regulatory skills and strategies for self-care. Anecdotal reports from students in this study suggest that they were incorporating the skills they learned into their everyday lives. The skills helped them to cope with stresses at school, at home, and in their

neighborhoods. Teachers reported that the curriculum encouraged better communication amongst students and fostered more respect between teachers and students. Through discussions about the stresses that students were experiencing, teachers learned more about their students than they would have during regular class discussion. Students' perceptions of caring by their teachers have been associated with greater academic effort among students (Wentzel, 1997).

One limitation of the study is the lack of a control school. Difficulties in identifying an equivalent school in terms of demographics prevented such an inclusion. However, having observed a consistent pattern of higher grades associated with more exposures and lower grades associated with minimal exposure across the groups it is likely that had a control school been incorporated, the students in the intervention school would have had higher scores.

Another limitation is that teachers were not randomized into the study. Teacher participation was voluntary and thus the study was open to selection bias. Teachers who elected to be trained in relaxation-response strategies may have taught classes of students who had higher or lower grade point averages. There is also no way to determine if the increase in

Table 5
Changes in Academic Outcomes as a Result of Varying Levels of Exposure to Relaxation Response Curriculum - Spring 1996-1997

Group	Sum of Exposures to '96-'97 Relaxation Response Curriculum	Spring 1996 GPA	Spring 1997 GPA	Spring 1996 Work Habits	Spring 1997 Work Habits	Spring 1996 Cooperation	Spring 1997 Cooperation	Spring 1996 Attendance	Spring 1997 Attendance
1	0 (n = 48)	2.06	1.97	1.00	0.96	1.12	1.06	89.44	82.02
2	1-2 (n = 169)	2.18	2.09	1.07	1.07	1.22	1.21	89.52	86.00
3	3-4 (n = 229)	2.23	2.20	1.08	1.10	1.21	1.25	89.77	88.66
4	>4 (n = 149)	2.15	2.22	1.02	1.08	1.16	1.17	89.29	88.89
Group x time interaction p value			.27		.38		.39		.0003
p values for pairwise comparisons of group means									1 < 2 1 > 3 1 > 4 2 < 3 2 < 4 3 > 4 .01

scores was due to better student achievement or to decreased stress among trained teachers. It is also likely that the amount of practice of the relaxation response strategies varied from classroom to classroom.

In the analyses to determine the effect of the relaxation response intervention over consecutive 2-year periods, first-year exposures were not included in the grouping factor. Since changes in the outcome measures occurred, we assume that the further improvement in grades above the first year's scores was due to more exposure to the relaxation-response intervention. The pattern reveals that while there was an

increase in scores among students with more exposures, there was a relatively a greater decline in scores among students with fewer exposures. Thus, more exposures to the relaxation response curriculum may have prevented a decline in scores.

Although this study had several limitations, the results suggest that the benefits of incorporating a relaxation response curriculum into the schools outweigh the costs of implementing such a program. Students' academic achievement scores improved and this type of curriculum has now been shown to be effective at different grade levels.

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