Stress Management

Stress Management in Work Settings: A Critical Review of the Health Effects

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Abstract

Purpose. *To review critically the research literature on the health effects of worksite stress-management interventions.*

Search Methods. *Stress-management interventions were defined as techniques that are designed to help employees modify their appraisal of stressful situations or deal more effectively with the symptoms of stress. Stress-management studies that were worksite based, assessed a health outcome, and were published in the peer-reviewed literature were included in this review. The main search method was the one described in the lead article to this special issue of the JOURNAL, but supplementary sources included prior reviews of the research literature and expert contacts. Sixty-four studies met the criteria for inclusion in this review.*

Summary of Findings. *A variety of stress-management techniques was used in worksite studies, including muscle relaxation, meditation, biofeedback, cognitive-behavioral skills, and combinations of these techniques. The most common techniques used were muscle relaxation, cognitive-behavioral skills, and combinations of two or more techniques. Outcome measures to evaluate the success of stress interventions included physiologic and psychologic measurements, somatic complaints, and job-related measures. Nearly three-fourths of the studies offered the training to all workers and did not specifically recruit high-stress employees. Over half the studies were randomized control trials, but only 30% conducted posttraining follow-up evaluations. The effectiveness of stress interventions varied according to the health-outcome measure used; some techniques were more effective for psychologic outcomes (e.g., cognitive-behavioral skills), whereas others were more effective for physiologic outcomes (e.g., muscle relaxation). Biofeedback was the least frequent technique used in work settings and also seemed to be the least effective technique. Meditation produced the most consistent results across outcome measures but was used in only six studies. In general, studies using a combination of techniques (e.g., muscle relaxation plus cognitive-behavioral skills) seemed to be more effective across outcome measures than single techniques.*

Conclusions. *The large number of different stress-management techniques coupled with the wide range of health outcome measures used in stress intervention studies makes it difficult to draw firm conclusions about the efficacy of each technique and each outcome. Also, the quality of the methodology varied substantially among studies. Nevertheless, the most positive results across the various health outcomes were obtained with a combination of two or more techniques. None of the stress interventions was consistently effective in producing effects on job/organization-relevant outcomes, such as absenteeism or job satisfaction. To produce changes on these types of measures, stress interventions will need to alter or modify the sources of stress in the work environment. It can be said that stress management in work settings can be effective in enhancing worker physical and psychologic health, but the choice of which stress-management technique to use should be based on the specific health outcomes that are targeted for change.(Am J Health Promot 1996;11[2]:112-35.)*

Key Words: Anxiety, Blood Pressure, Job Satisfaction, Relaxation, Stress-Management Interventions, Worksite Health Promotion.

INTRODUCTION

Evidence from a number of sources indicates that workers in increasing numbers are falling victim to stress at work. For example, the 1985 U.S. National Health Interview Survey revealed that 30% of employed workers reported that exposure to mental stress was the work condition that most endangered their health.[1] This 30% represented an estimated 11 million workers. In a national survey conducted by the Northwestern Mutual Life Insurance Company, 46% of the 600 workers interviewed said that their job was very stressful, and 27% said their job was the single greatest cause of stress in their lives.[2] Similarly, in a survey of 200 medical personnel and employee assistance program directors randomly selected by the New York Business Group on Health, a majority (56%) reported emotional, behavioral, and mental health problems to be pervasive in their workplaces.[3] In the most recent survey, the St. Paul Fire and Marine Insurance Company analyzed job stress data obtained from 28,000 workers in 215 different organizations and summarized the results in a report titled *American Workers Under Pressure.*[4] The report indicated that stress at work was a prevalent problem associated with employee burnout, acute and chronic health problems, and poor work performance.

Worker compensation data and Social Security Administration disability data confirm that stress is a growing problem. For example, a 1985 study by the National Council on Compensation Insurance[5] found that worker compensation claims involving gradual mental stress accounted for nearly

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11% of all occupational disease claims between 1981 and 1982.

A recent analysis of disability claims managed by the Northwestern Mutual Life Insurance Company[2] found that the percentage of stress-related cases more than doubled from 1982 to 1988 (6% to 13%). The average set-aside cost for stress-related claims was nearly $73,000 per case, and the rehabilitation success rate for stress claimants was 33% compared to 80% for all other claimants. From 1975 to 1976, mental disorders (which include stress-related conditions) were the third most disabling condition among workers receiving Social Security Administration disability allowances, preceded only by musculoskeletal injuries and circulatory diseases.[6] By 1988, mental disorders had become the most prevalent disabling condition among Social Security Administration disability allowance recipients, accounting for 21% of all allowances.[7]

The federal sector has also responded to evidence that stress has become a national health problem. In 1984, the National Institute for Occupational Safety and Health (NIOSH) listed psychologic disorders (stress) as one of the top ten leading work-related diseases and injuries and later formulated a national strategy for the prevention of psychologic disorders in the workplace.[8] The American Psychological Association has brought national attention to the issue of job stress by joining with NIOSH to host scientific conferences on job stress in 1990, 1992, and 1995.[9]

What is Stress?

Hans Selye,[10] considered the "father" of stress research, discovered that a wide range of stimuli (stressors), such as exposure to temperature extremes, physical injury, or injection of toxic substances, evoked an identical pattern of change in specific body organs of laboratory rats. In each case, the cortex of the adrenal gland became enlarged, the thymus and lymphatic structures became involuted, and deep bleeding ulcers developed in the stomach and intestines. This patterned, somatic response to harmful stimuli was called the *general adaptation syndrome,* and stress was defined as the *nonspecific response* of the body to any demand.[10] Cannon[11] had earlier described a "fight or flight" response in humans when confronted by potentially dangerous situations. The response was an integrated mobilization of the body's resources that included elevated heart rate and blood pressure, a redistribution of blood flow to the major muscle groups and the brain and away from distal body parts, and a decrease in vegetative functions.

Lazarus[12] described in more specific terms how one's perception of events or situations determines the health valence of objective events. Lazarus described cognitive appraisal as the intrapsychic process that translates objective events into perceptual experiences. The importance of this formulation is in its recognition that subjective factors can play a much larger role in the experience of stress than objective factors. Indeed, any given objective event can be perceived in a positive way by one person and as stressful by another (one person's meat is another person's poison).

In work settings, stress can be produced by an array of job/task, psychosocial, and organizational factors. The earliest definitions of job stressors were related to work roles, and scales designed to measure role conflict and ambiguity were developed.[13] Even today, these are common types of stressors assessed. Measures of workload (overload and underload), work pace, variance in workload, autonomy, underutilization of skills, and participation in decision making were routinely used in job stress studies in the 1970s and 1980s. Many of these measures were borrowed from the fields of industrial psychology and organizational behavior. Job characteristics such as skill variety, task identity, task significance, autonomy, and feedback were measured and have been related to employee job satisfaction, morale, absenteeism, and productivity.[14-17] Holt[18] identified 54 different measures of job stressors as well as a growing list of stress-related health outcome measures, including coronary heart disease, high blood pressure, digestive disorders, anxiety, depression, irritation, absenteeism, turnover, accidents, and substance abuse.

In addition to the large lists of stressors and outcomes, a list of moderator variables also was growing. Moderators are variables that affect the extent to which exposure to job stressors results in adverse health consequences; they include personality traits, coping skills/strategies, nonwork factors, and demographics (e.g., age, sex). The lists of stressors, outcomes, and moderators are not static but continue to grow, recently incorporating variables such as mergers, acquisitions, and downsizing as stressors, psychoneuroimmunologic measures as outcomes, and aspects of career development as moderators.[9] Unlike physical and chemical hazards, job stressors respect no occupational boundaries, and the potential for exposure to this class of health risks is ubiquitous.

Health Effects of Stress

Because of the pervasive effects of stress on many different body systems, its health effects are diverse. Research has linked stress to biochemical changes (e. g., levels of adrenaline, noradrenaline, cortisol, angiotensin, aldosterone, cholesterol, triglycerides, and immunologic activity), psychophysiologic effects (heart rate, blood pressure, muscle tension), psychologic changes (anxiety, depression, irritability), and acute and chronic health conditions (hypertension, coronary artery disease, ulcers).[8,10-12] In work settings, stress has been associated with an equally wide range of health and performance outcomes. Examples include reduced productivity, absenteeism, turnover, premature disability, accidents and injuries, substance abuse, and excessive health-care costs.[8,14-18]

Focus of This Review

This article reviews the health effects of stress-management interventions implemented in work settings. Stress-management interventions are defined as techniques and programs that are designed to help employees modify their appraisal of stressful situations or to deal more effectively with the symptoms of stress, or both. Typically, stress-management interventions are prescriptive, person-oriented, relaxation-based techniques, such as progressive muscle relaxation, biofeed-

back, meditation, and cognitive-behavioral skills training. As health promotion activities, stress-management interventions are distinct from interventions that seek to alter the sources of stress at work through job redesign or organizational change strategies.

METHODS

This review of the health impacts of worksite stress-management programs is part of a larger review of the impact of health promotion programs on health outcomes sponsored by the Centers for Disease Control and Prevention. The Centers conducted the initial search for studies with the goal of identifying all the published reporting of the health impact of worksite health promotion programs. This search is described in the introductory article to these reviews.

Excluded from this review were studies that evaluated worksite physical fitness or exercise programs (which are reviewed in another article in this issue of the JOURNAL), although they could be considered stress-management interventions as defined earlier. Interventions offered within large, multicomponent company health promotion programs also were excluded from this review because it is impossible to untangle the unique effects of the stress interventions from the other health promotion activities offered in these programs. Studies that attempted to change some aspect of the job or the organization also were excluded because they are conceptually distinct from the stress-management interventions reviewed in this article (see Murphy[93] for review of the job/organizational change literature). Finally, intervention studies that did not evaluate a health outcome or that were published outside the peer-reviewed literature (e.g., in book chapters), were excluded from this review.

A total of 64 published articles were identified for inclusion in this review. It is significant that reviews of this literature conducted about 10 years ago identified only about one third as many studies.[19-20] In addition to an increase in the number of published studies, the quality of studies also has increased in methodologic rigor.

REVIEW OF THE LITERATURE

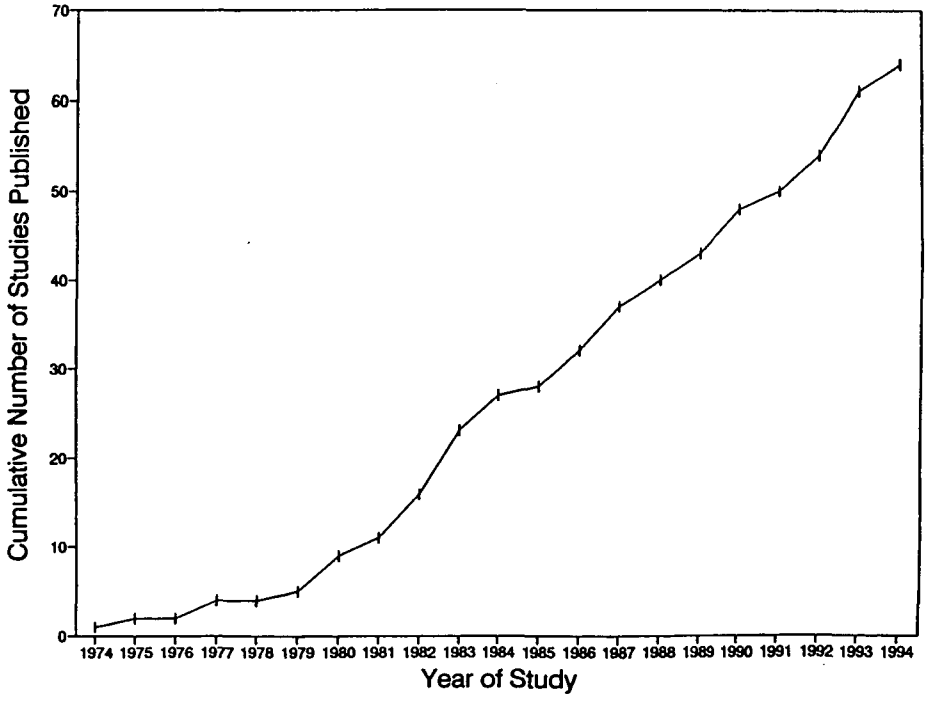
Figure 1 shows the number of stress-management studies published in the scientific literature in the 20-year period from 1974 through 1994. The figure illustrates two important points. First, few studies were published in the peer-reviewed literature before 1980. In fact, worksite health promotion programs of any type were rare before that time. Second, since 1980, the number of stress-management articles published has averaged about four per year. The continued presence of stress intervention studies in the published literature attests to the importance of the problem of work stress and the continued interest in worksite interventions to reduce stress.

Table 1 presents a summary of the 64 stress-management studies reviewed in this article. Entries in the table are arranged according to the year of publication, and alphabetically within publication year. Most of the studies (51 of 64) involved working populations in the United States, but studies of workers in Australia, China, Great Britain, Norway, Scotland, and Sweden also were included. Almost 75% of the studies (47 of 64) were preventive in nature; that is, the intervention was offered to all employees who volunteered, and workers with stress problems were not specifically recruited. In the remaining 17 studies, workers with specific problems (excessive stress, high anxiety, or hypertension) were specifically recruited for study from the general employee population.

Most of the studies used a mixed group of occupations (e.g., manufacturing employees) or did not specify the occupations under study. In the studies that did describe the subjects' occupations, most employees were white-collar workers, and blue-collar workers were targeted specifically in only five studies.[30,46,51,79-80] Certain occupations, such as teachers (14 studies), nurses (8 studies), and police officers (3 studies), were targeted for

Figure 1

Cumulative Number of Worksite Stress Management Studies Published from 1974 to 1994 (N = 64)



stress-management interventions more often than others. Gender differences were also evident. On average, the samples were 66% female; 16 studies included all female workers, and five studies included all male workers.

With respect to the five programmatic categories of health promotion programs (i.e., organizational policy, manager/supervisor training, employee education, family education, and service/philanthropy), all of the studies in this review involved employee education, and none fell into the other four categories.

Basic Formats of Stress-Management Programs

Unlike other health promotion programs, the stress-management programs reviewed in this article did not follow a fixed set of programmatic activities, and there was great variability in the strategies used. For the purpose of this review, interventions were grouped into five categories: progressive muscle relaxation, meditation, biofeedback, cognitive-behavioral skills training, combination of techniques, and other techniques. With the exception of meditation, stress-management techniques applied in work settings have been borrowed from the fields of clinical and counseling psychology, where they have demonstrated success in the treatment of anxiety and psychosomatic disorders. (A more detailed description of these techniques can be found in Murphy.[85])

Progressive Muscle relaxation involves focussing one's attention on muscle activity, learning to identify even small amounts of tension in a muscle group, and practicing releasing tension from the muscles.[86] The underlying theory is that, because relaxation and muscle tension are incompatible states, reducing muscle-tension levels indirectly reduces autonomic activity and, consequently, anxiety and stress levels. Muscle relaxation is usually accomplished by a series of alternating tensing and relaxing exercises: creating tension in a muscle group (e.g., clenching one's fist), studying the feelings of tenseness, allowing the muscles to relax, and noticing the difference between the tense and relaxed states. By systematically moving through the major muscle groups of the body, a person can become proficient at recognizing tension in a muscle group and relieving that tension.[87]

Biofeedback is based on a fundamental principle of learning: people learn best when they are provided with feedback on their performance, that is, knowledge of results. In biofeedback training, a person is provided with information or feedback about the status of a physiologic function and, over time, learns to control the activity of that function. For example, the electrical activity produced when muscles contract or tense can be recorded and transformed into a tone, whose pitch rises as muscle activity increases and falls as muscle activity decreases. Using the feedback tone as an indicator of muscle-tension level, a person can learn how to reduce muscle-activity levels and create a state of relaxation.[88]

The most widely known type of **meditation** is Transcendental Meditation, which was developed as a component of yoga by the Maharishi Mahesh Yogi.[75] Transcendental Meditation involves sitting upright in a comfortable position in a quiet place, with eyes closed and mentally repeating a secret mantra (a word or sound) while maintaining a passive mental attitude. Meditation methods used in worksite stress-management studies often are secular variations of Transcendental Meditation. The secular version developed by Herbert Benson,[89] called the *Respiratory One Method*, has been the most widely used form of meditation in work settings. In Benson's method, a person finds a quiet place and sits comfortably for 20 minutes twice a day. While maintaining a passive attitude toward intruding thoughts, the person repeats the word *one* or some other neutral word with each exhalation. Benson recommends that each person choose a word or phrase that has personal significance to use during meditation. Meditation is thought to invoke a "relaxation response," which is the opposite of the stress response. With practice, persons learn to invoke the relaxation response at will.

Cognitive-behavioral skills training refers to an assortment of techniques designed to help participants (1) modify the appraisal processes that determine the stressfulness of situations, and (2) develop behavioral skills for managing stressors. Cognitive methods help people restructure their thinking patterns and are often referred to as cognitive restructuring techniques. Stress inoculation,[90] the most common type of cognitive-behavioral skills training used in work settings, has three stages: education (learning about how the person has responded to past stressful experiences); rehearsal (learning various coping-skills techniques, such as problem solving, relaxation, and cognitive coping); and application (practicing the skills under simulated conditions). In essence, cognitive-behavioral strategies deal with a fundamental symptom of stress: disordered thinking.

Combinations of one or more stress-management techniques linked into a single intervention were the most common stress-management interventions in the worksite studies reviewed for this article. All of the combinations had muscle relaxation as a component; the most frequent combination of techniques involved muscle relaxation plus cognitive-behavioral skills training.

The other methods category includes an assortment of other techniques that do not fit into any of the above four categories. Examples are posttraumatic debriefing sessions, the value of writing about traumatic events, worker social-support programs, health-education interviews, and brief psychodynamic therapy.

Substantial variability was found in the health-outcome measures used in the intervention studies. These included biochemical assays, psychophysiologic measures, and self-reports of psychologic state and somatic symptoms. In addition, organizational outcome measures, such as job satisfaction, work performance, absenteeism, and turnover, were used in more than half of the studies.

Programmatically, stress-management interventions in work settings were usually offered as prevention activities, designed to educate workers about the nature and sources of stress and to provide basic relaxation skills that are useful in everyday life.

Text continues on page 128.

Table 1

Summary of Stress-Management Studies

Study	Purpose of Evaluation	Research Design Rating	Sample Size	Sample Description	Comparison Group
Frew[21] (1974)	Evaluate whether experienced meditators were more productive and satisfied at work than nonmediators.	**	42 workers	Experienced meditators were recruited from a local TM trainer (34% female).	Coworkers also filled out the questionnaires
Shoemaker and Tasto[22] (1975)	Compare muscle relaxation (PMR) and biofeedback (BIO) training for lowering blood pressure.	*****	15 white collar workers	Hypertensive workers were recruited from university employees and faculty. (% not reported)	Wait list
Peters, Benson, and Porter[23] (1977)	Assess the effects of relaxation-meditation training on blood pressure.	*****	194 manufacturing employees	Workers were recruited from the corporate offices of a manufacturing firm (54% female).	3 groups: 1. Sit quietly 2. Wait list 3. Nonvolunteers
Peters, Benson, and Peters[24] (1977)	Assess the effects of relaxation-meditation training on stress symptoms, worker performance and general well-being.	*****	194 manufacturing employees	Workers were recruited from the corporate offices of a manufacturing firm (54% female).	3 groups: 1. Sit quietly 2. Wait list 3. Nonvolunteers
Sarason, Johnson, Berberich, and Siegal[25] (1979)	Assess the efficacy of combined PMR + COG-BEH training for reducing anxiety and anger.	****	18 police academy trainees	Trainees judged to be best suited to police work were selected from a larger group of trainees (44% female).	Education only
Carrington, Collings, Benson, Robinson, Wood, Lehrer, Woolfolk, and Cole[26] (1980)	Compare the efficacy of two types of meditation and progressive muscle relaxation on the frequency of psychiatric symptoms.	*****	154 telephone company employees	Employees of the New York telephone company. were recruited via posters. Those with prior experience in meditation were excluded (54% female).	Wait list
Gray-Toft[27] (1980)	Assess the effects of a counseling support program on reported stress, job satisfaction, and staff turnover.	****	17 nurses in the hospice unit of a large hospital	All nurses in the hospice unit participated in the training program. (100% female)	Delayed treatment
Guzicki Coates and Goodwin[28] (1980)	Assess the efficacy of cue-controlled relaxation for reducing symptoms of stress in anxious teachers.	****	2 elementary school teachers	Two teachers who reported problems dealing with anxiety were selected from those who volunteered (50% female).	One teacher served as control for the first 5 days of training.
Manuso[29] (cited in Schwartz, 1980)	Assess the effectiveness of BIO and other stress management techniques on stress symptom reduction.	***	30 workers	Workers with chronic headaches or chronic anxiety were recruited for the study. (% not reported)	None
Patel, Marmot, and Terry[30] (1981)	Assess the utility of stress management for reducing blood pressure in hypertensive workers.	*****	204 manufacturing employees in Great Britian	Hypertensive workers were recruited via blood pressure screening program (60% male).	Education and information

Note: PMR = progressive muscle relaxation training; BIO = biofeedback; MED = meditation; CSM = Clinically-standardized meditation; GSR = galvanic skin resistance; ROM = Respiratory One Meditation; PMR = progressive muscle relaxation; BIO = biofeedback; COG-BEH = cognitive-behavioral skills training; STAI = State-Trait Anxiety Inventory; JDI = Job Descriptive Index; SCL90R = Symptom Checklist 90 (Revised): scales = anxiety, depression, somatization, hostility, interpersonal sensitivity, obsessive-compulsive, phobic, paranoia, psychoticism.

Research Design Rating:

***** Evidence obtained from properly conducted study with a randomized control group
**** Evidence obtained from properly conducted study with control group but without randomization
*** Evidence obtained without a control group or randomization but with an evaluation
** Evidence obtained without intervention but that might include long-term or dramaticresults from general dissemination of information or medical agent into a population
* Evidence that is descriptive, anecdotal, or authorative

Table 1, continued

Evaluation Period	Outcome Measures	Research Design	Findings
N/A	Productivity satisfaction; relationships with coworkers	There was no intervention in this study; experienced meditators were recruited for the study.	Experienced meditators reported higher job satisfaction and productivity, and lower turnover propensity. Coworker ratings of meditators confirmed the job satisfaction results, but not the productivity or turnover results.
2 weeks	Blood pressure	Six sessions were held on alternate days over a 2-week period.	PMR and BIO training each produced significant decreases in blood pressure compared to controls. Effects for PMR were larger than those in the BIO group.
12 weeks	Blood pressure	Workers attended 2 to 3 1-hour sessions over 4 weeks to learn the relaxation-meditation technique, and then 2 daily 15-minute relaxation breaks for 8 weeks.	The relaxation-meditation group showed larger reductions in blood pressure than controls. The self-relaxation group showed positive changes that were larger than the other control groups, but smaller than those for the relaxation-meditation group.
12 weeks	Symptom checklist; illness index; work performance; job satisfaction; happiness	Workers attended 2 to 3 1-hour sessions over 4 weeks to learn the relaxation-meditation technique. Then 2 daily 15-minute relaxation breaks.	The relaxation-meditation group showed larger reductions on self-report measures than the control groups. The self-relaxation group showed changes that were intermediate in size.
Unknown	Blood pressure; anxiety (STAI); hostility; performance ratings	Details of the training were not reported.	No differences were found between trained and control groups on blood pressure, pulse, or anxiety, but hostility levels were *higher* among trained workers. Trained workers received slightly higher work performance ratings.
6 weeks; 5.5 months	Psychiatric symptom checklist (SCL90R)	Tape-recorded instructions and written materials were given to workers who learned techniques at home, and were told to practice twice per day for 20 minutes each time. One group meeting was held to facilitate learning.	All 3 trained groups and controls showed reductions in psychiatric symptoms (depression, somatization, hostility, etc.) at the 5.5 month follow-up. The largest changes in symptoms occurred for all groups at 6 weeks, with smaller declines still evident at 5.5 months. Changes for the 2 meditation groups, but not the PMR group, were larger than controls.
9 weeks	Nursing Stress Scale: (contains 40 stressful situations that can occur among nurses); job satisfaction (JDI); staff turnover	Nurses met in groups of 8 (day/afternoon shift, night shift) for 1 hour per week for 9 weeks. Group sessions had 2 phases: personal sharing and structured exercises such as relaxation, or conflict resolution.	The counseling support group reported higher satisfaction with coworkers than controls and lower job stress at the end of training than the start. Turnover for the hospice unit after training was 0, and was lower than all other hospital units.
22 days	Anxiety; teacher behaviors	Two teachers were trained separately in 3 workshops. Training consisted of PMR and cue-controlled relaxation.	Both teachers showed a drop in self-reported anxiety and in the frequency of anxious behaviors after training.
5 weeks; 3 months	Muscle tension; stress symptoms; clinic visits; symptom interference with work	Workers received 5 weeks of training, 3 times per week, 2-week posttraining assessment, and 3-month follow-up. Training included biofeedback, muscle relaxation, and breathing exercises.	Posttraining reductions were found on all measures. Stress-related clinic visits (per subject) dropped from 5.75 before training to 1.70 at the 3-month follow-up. Cost-benefit ratio calculated for the training program was 1:5.5, i.e., each dollar spent was associated with a savings of $5.50.
8 weeks; 8 months	Blood pressure; pulse; plasma renin, angiotensin, aldosterone	Training was conducted in weekly 1-hour sessions over 8 weeks, and consisted of PMR, COG-BEH, and, and GSR biofeedback.	Significant reductions were found among trained workers on *all* measures after training and at follow-up. The size of the effects at follow-up was the same as those observed post-training.

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Table 1, continued

Study	Purpose of Evaluation	Research Design Rating	Sample Size	Sample Description	Comparison Group
Forman[31] (1981)	Evaluate the effects of stress management training on anxiety and worker satisfaction with various aspects of the job.	****	8 school psychologists	Unknown. (% not reported)	Untrained group
Drazen, Nevid, Pace, and O'Brien[32] (1982)	Compare rational-emotive therapy and anxiety management training for helping workers reduce high blood pressure.	*****	22 white collar employees	Workers with mild hypertension were recruited via a blood pressure screening program offered at the worksite (73% male).	Group discussion
Forman[33] (1982)	Evaluate the effects of stress management training on anxiety and teacher behaviors.	****	12 school teachers	Unknown (83% female).	Wait list
Ganster, Mayes, Sime, and Tharp[34] (1982)	Assess the effects of stress management training on physiologic, biochemical and psychologic indicators of stress.	*****	79 employees of a public agency	Workers from all levels in the organization were recruited via a company poll and informational seminar on stress (92% female).	No treatment
Seamonds[35] (1982)	Assess the effects of a single health education interview on employee absenteeism.	****	500 corporate employees who participated in a periodic medical exam	Workers with multiple symptoms of stress plus frequent visits to medical department were selected from a larger pool of workers who received periodic medical exams. (% not reported)	Controls matched on job classification, sex, and job stress score
Steinmetz, Kaplan, and Miller[36] (1982)	Develop a stress questionnaire and use it to assess change due to stress management training.	***	243 workers in various occupations	Unknown. (% not reported)	None
Alderman and Techlenburg[37] (1983)	Assess the effect of relaxation training on anxiety, personal adjustment and perceptions of organizational climate.	*****	55 employees of various occupations	Volunteers were recruited from manufacturing companies, a hospital, and a newspaper via posters and newspaper advertisements (62% female).	1. Self- relaxation 2. No treatment
Bowers[38] (1983)	Assess the feasibility of implementing a holistic stress management program in an industrial plant.	***	25 manufacturing employees	A maximum of 25 workers were recruited via interoffice memorandum 1 week before the program start (60% female).	None
Friedman, Lehrer and Stevens[39] (1983)	Assess the influence of locus of control beliefs on the effectiveness of stress management training.	*****	85 teachers	Any teacher who expressed an interest in the training program, and who was not receiving therapy for an emotional disorder, was selected (87% female).	Self-directed
Manuso[40] (1983)	Assess the effectiveness of group-administered stress management training on an "at-risk" sample of workers.	***	47 workers in various occupations	Workers were recruited based on their scores on a Type A Inventory (37 Type A and 10 Type B workers). (% not reported)	None
Murphy[41] (1983)	Compare the effectiveness of PMR and BIO for reducing symptoms of stress and improving job satisfaction.	*****	28 nurses	Nurses were recruited via posters at the hospital. (100% female)	Self-relaxation
Seamonds[42] (1983)	Replicate a prior study[35] and assess the effects of a health education interview on employee absenteeism.	****	1000 corporate employees who participated in a periodic medical examination	Workers with multiple symptoms of stress plus frequent visits to medical department were selected. (% not reported)	Controls were matched on job classification, sex, and job stress score

Table 1, continued

Evaluation Period	Outcome Measures	Research Design	Findings
6 weeks	Anxiety (STAI); job satisfaction	School psychologists were trained in COG-BEH techniques during 2-hour weekly sessions held for 6 consecutive weeks.	Trained workers reported reductions in state and trait anxiety compared to controls, and improved job satisfaction. A second study of 16 school teachers found that training improved perceptions of school psychologic services.
10 weeks; 2 months	Blood pressure	Workers were trained in small groups during weekly, 40-minute sessions. One group received rational-emotive training, the other anxiety management training.	No differences were found among groups at posttraining or at follow-up. Within group (over time) changes in blood pressure occurred for both trained groups, but not for the control group. Nonspecific effects of training were noted as important.
6 weeks	Anxiety (STAI); work stress levels; teacher behaviors	School teachers were trained in COG-BEH and muscle relaxation during 3-hour, weekly sessions held for 6 consecutive weeks.	The trained group showed significant reduction in anxiety and work stress levels compared to controls. No differences were found on the measure of teacher behavior.
8 weeks; 4 months	Anxiety (STAI); depression; irritability; somatic complaints; adrenaline; noradrenaline	Training occurred in large groups, and included cognitive restructuring, progressive muscle relaxation, and biofeedback.	Significant decreases in adrenaline, depression and irritability were found for trained workers compared to controls. Effects for adrenaline were present at follow-up. No effects found for anxiety or somatic complaints.
1 day; 6 months	Absenteeism; no. of referrals to community agencies	Workers received a health interview covering a wide range of topics (e.g., stress, coping, exercise); were given relevant written materials and referred to community agencies.	Workers who received the health interview had lower absenteeism in the 6-month period after the interview, than in the 6 month period before the interview. The largest reduction in absenteeism occurred in the group reporting moderate stress levels; smaller effects were found for groups with lowest and highest stress.
4-6 weeks	Job stressors; stress symptoms; job dissatisfaction	Workers were taught muscle relaxation, cognitive restructuring, and assertiveness skills. Some workers were trained in 2-hour weekly sessions for 4 weeks; others in 1.5 hr. sessions for 6 weeks.	The trained group showed an *increase* in job dissatisfaction, and increase in individual change skills. However, the pre- and posttraining data were not identified by individual, so only total group analyses could be performed. A second study of 16 medical students conformed the prior results.
1 day; 3 months	Anxiety; organizational climate; personal adjustment	Workers participated in a stress management seminar during which they received instructions on relaxation training and were given an audio tape for twice daily home practice of relaxation.	Workers trained in relaxation techniques reported significantly lower anxiety and better personal adjustment 3 months after training had begun, but no changes in perceived organizational climate. No effects were found for workers in the control groups.
6 weeks	Stress symptoms	The training consisted of weekly 1-hour classes consisting of stress education, discussion, and PMR training. Workers were asked to practice PMR between sessions.	The number of self-reported stress symptoms decreased after the 6 week training program, but no tests of significance were performed on the data.
5 weeks	Anxiety (STAI); subjective stress; locus of control	Workers met for 2 hours per week for 5 weeks and were taught PMR + COG-BEH skills. They were given a relaxation tape and asked to practice three days per week between sessions.	Both trainer-directed and self-directed relaxation training resulted in larger decreases in anxiety than the no-training control condition. Locus of control beliefs (internal vs external) were not a significant factor in training effectiveness.
6 weeks	Use of health care services; Perceived stress	Both Type A and B workers attended a 6-session workshop and were taught relaxation, assertiveness, and cognitive restructuring.	Both Type A and B workers had lower use of health services by 50% at the completion of the program, and stress symptoms fell by 45%. No statistical analyses were presented.
10 days; 3 months	Muscle tension; hand temperature; anxiety (STAI); psychiatric symptom checklist (SCL90R); job satisfaction; work performance; coping skills; sleep habits	Nurses received training in either EMG biofeedback, PMR, or self-relaxation during 10 daily 1 hour sessions (2 baseline, 6 training, 2 practice days). PMR training was conducted via cassette tape.	Nurses who learned PMR showed a significant decrease in muscle activity levels after training compared to controls, but no reductions in hand temperature. BIO groups had significant reductions in hand temperature, but not muscle activity levels. No post-training differences found for self-report measures.
1 day; 1 year	Absenteeism; no.of referrals to community agencies	Workers received a health interview covering a wide range of topics (e.g., stress, coping, exercise), were given relevant written materials, and referred to community agencies.	Reductions in absenteeism after the health education interview reported after 6 months were still present 1 year later, and the effects were replicated in the second group of 500 workers.

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Table 1, continued

Study	Purpose of Evaluation	Research Design Rating	Sample Size	Sample Description	Comparison Group
von Beyer and Krause[43] (1983-84)	Evaluate the effectivenss of COG-BEH training on anxiety levels of critical care nurses.	*****	14 nurses	All nurses in the burn unit of a university medical center participated in the project. (100% female)	Delayed treatment
Charlesworth, Williams, and Naer[44] (1984)	Determine the cost-benefit of multi-modal stress management training for hypertensive workers.	*****	54 workers	Hypertensive workers were recruited via blood pressure screening conducted at work,and stratified by blood pressure level at entry,age, and sex. (% not reported)	Wait list
McNulty, Jeffrys, Singer, and Singer[45] (1984)	Study the effects of stress management training on catecholamine levels of police recruits.	****	44 police recruits	Not reported. (% not reported)	Education group
Murphy[46] (1984)	Compare the efficacy of BIO and PMR for reducing physiologic and psychologic signs of stress.	*****	52 highway maintenance workers	Workers were recruited via posters and flyers distributed at the worksite, and through advertisements by the training department (90% male).	Wait list
West, Horan, and Games[47] (1984)	Identify the key elements of stress inoculation training that result in reduced physiologic and psychologic signs of stress.	*****	60 registered nurses	Nurses were recruited via intensive advertising campaign conducted within the hospital (100% female).	No treatment
Sharp and Forman[48] (1985)	Compare the effectiveness of stress inoculation training and classroom management training on teacher anxiety.	*****	60 teachers	All teachers in the school district (N = 1170) were sent letters inviting them to participate in after-school, stress management workshops (80% female).	Wait list
Firth and Shapiro[49] (1986)	Compare the effectiveness of 2 forms of individual psychotherapy for reliving job stress.	***	40 managers from Great Britian	Managers were referred for therapy in response to advertisements to major organizations (58% male).	None
Higgens[50] (1986)	Compare the relative effectiveness of PMR and COG-BEH training for reducing stress symptoms.	*****	69 white collar workers	Not reported (100% female).	Wait list
Murphy and Sorenson[51] (1986)	Assess the long-term effects of PMR and BIO training on absenteeism, accidents, and performance ratings.	****	117 highway maintenance workers	Workers who received either PMR or BIO training in a prior study[46] plus 80 workers who did not participate in the prior study. (92% male).	Randomly selected controls
Tunnecliffe, Leach, and Tunnecliffe[52] (1986)	Compare the effectiveness of relaxation training and behavioral consultation for reducing stress.	*****	21 primary school teachers	The entire teaching staff of three matched primary schools participated in the study. (71% female)	Wait list

Table 1, continued

Evaluation Period	Outcome Measures	Research Design	Findings
8 weeks	Anxiety (STAI); daily stressors	Nurses (n=7) received COG-BEH + PMR training during individual, one hour sessions over a period of 5-8 days. Nurses who received the training one week later served as controls.	The training resulted in lower anxiety levels for the trained group compared to the delayed treatment controls. The effects were evident 10-18 days after training. Reductions in anxiety were more pronounced for inexperienced nurses than experienced nurses.
10 weeks; 3 years	Blood pressure; health behaviors; health insurance claims	The program consisted of a 5-week baseline period, followed by 10 weeks of training (once per week meetings). Training included muscle relaxation, deep breathing exercises, desensitization, and cognitive restructuring.	Significant posttraining decreases in blood pressure were found for the trained group compared to controls. The effect of training on blood pressure was replicated with the wait list group. Trained group had lower health care claims (in dollars) than controls and maintained lower blood pressure 3 years later.
10 weeks	Adrenaline; noradrenaline	Training consisted of weekly 1.5 hour sessions involving PMR + COG-BEH techniques, with home practice between sessions.	Trained group had lower posttraining levels of adrenaline than controls; no differences were found for noradrenaline.
10 days; 3 months	Muscle tension hand temperature; anxiety (STAI) Psychiatric symptom checklist (SCL90R); job satisfaction; work performance; coping skills; sleep habits	Workers received either BIO or PMR during 10 daily 1-hour sessions (2 baseline, 6 training, 2 application practice days). PMR training was conducted via commercially available cassette tape.	BIO group had significantly larger reductions in EMG levels than PMR or control group. No other group differences were significant. At follow-up, EMG levels for all groups increased relative to posttraining levels, but did not regress to baseline levels. BIO group reported fewer sleep disturbances than the other groups, but no group differences on other self-report measures.
5 weeks; 4 months	Anxiety (STAI); job-related tension; blood pressure	Workers were assigned to one of three groups, corresponding to the components of stress inoculation (SI) procedure: stress education, cognitive skills, and exposure to simulated stressors. A fourth group received all components. Training occurred in weekly, 1-hour, individual sessions over 4 weeks.	Workers who received the complete stress inoculation (SI) training showed larger changes on outcome measures than controls. However, workers who received only coping skills training showed the largest and most consistent improvements on *all* measures, and these effects were still evident at follow-up 4 months later. Coping skills was identified as the "active ingredient" of SI training.
4 weeks; 4 weeks	Anxiety (STAI); teacher classroom behavior	Teachers were taught stress inoculation (COG-BEH + PMR + behavior modeling) or classroom management training (problem identification during 8 2-hour sessions conducted twice weekly for 4 weeks.	Both stress inoculation training and classroom management training led to significant posttraining reductions in anxiety compared to controls, and significant reductions in behavioral manifestations of anxiety.
22 weeks; 35 weeks	Stress symptoms; Psychologic problems; depression; social adjustment at work	Participants received either COG-BEH training or psycho-dynamic/humanistic therapy. After 8 weeks, workers received the other therapy.	Significant improvement in stress symptoms was observed after the first 8 sessions for both trainined groups; the last 8 sessions produced no added improvement.
7 weeks	Burnout; psychologic strain; absenteeism	Participants received either behavioral conditioning or cognitive skills training. Groups met for 1.5 hrs initially, which was decreased to 30 minutes by the last session.	Both treatment groups displayed lower burnout scores after training compared to controls, and the 2 treatment groups produced equivalent effects. Absenteeism *increased* in the treatment groups after training relative to controls. The treatment groups had significantly lower absenteeism before training than controls.
4 years	Absenteeism; tardiness; accidents; performance ratings	Personnel records for workers in a prior study[1] were compared with a group of randomly selected nonparticipants for the 2.5 years before training, and 1.5 years after training.	The PMR group had lower absence frequency and hours absent, and fewer Monday or Friday absences than BIO or control groups during the 1.5 years after training. There were no group differences on tardiness, accidents or performance ratings.
5 weeks; 3 months	Perceived stress at work	Teachers were randomly assigned to one of two training groups, PMR or collaborative behavioral consultation (CBC), or a wait list control group. The trained groups met weekly, 1.5 hour sessions for 5 weeks during after-school hours.	Both PMR and CBC groups had lower perceived stress levels after training than controls, and the effects were larger for the CBC group than the PMR group. At the 3 month follow-up, the CBC group still had lower perceived stress levels than controls, but the stress levels of the PMR group were similar to controls. The superiority of the CBC group was probably due to its focus on work-related problem-solving activities.

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Table 1, continued

Study	Purpose of Evaluation	Research Design Rating	Sample Size	Sample Description	Comparison Group
Agras, Taylor, Kraemer, Southam, and Schneider[53] (1987)	Compare the effects of various worksite stress management techniques for lowering blood pressure.	*****	158 employees at 2 large companies	Workers with mild hypertension were identified via a screening program. (82% male)	Blood pressure monitoring only
Bruning and Frew[54] (1987)	Compare the effectiveness of 3 stress management methods (COG-BEH, CSM, and exercise).	*****	65 workers at a hospital equipment facility	Workers recruited at an informational lunchtime seminar (80% male).	No treatment
Chesney, Black, Swan, and Ward[55] (1987)	Evaluate the effectiveness of PMR for lowering blood pressure among workers on hypertensive medication.	*****	137 employees at two large companies	Workers with hypertension that was not well controlled by medication were identified via a three stage screening process (88% male).	Blood pressure monitoring only
Larsson[56] (1987)	Assess the effects of relaxation and mediation training (during regular basic training) on performance of military officers.	****	516 commissioned officers and cadets in Sweden	Officers and cadets in 4 platoons were ordered to take part in the study (100% male).	Regular basic training
Sallis, Trevorrow, Johnson, Hovell, and Kaplan[57] (1987)	Compare the effectiveness of PMR and PMR+COG-BEH training for reducing blood pressure and psychologic symptoms of stress.	*****	76 employees from two high tech companies in Southern California	Workers were recruited via posters, notices in company newspapers, interoffice mail, electronic mail, and presentations at staff meetings (43% female).	Education
Butcher and Davis[58] (1988)	Determine whether a short stress management course would result in improved knowledge about stress and coping abilities.	***	40 community health workers	Workers recruited via a letter sent to all workers[1] (100% female).	Mone
Keyes and Dean[59] (1988)	Evaluate the effects of stress inoculation training on anger management.	*****	100 direct care workers	Training was conducted as part of the faculty development program (71% female).	Attention control
Long[60] (1988)	Compare the efficacy of COG-BEH training, alone and in combination with physical exercise for reducing teacher stress.	*****	75 teachers from 6 schools	Teachers were recruited via a needs assessment survey sent to all schools in the district (60% female).	Minimal exercise group
Bertoch, Nielsen, Curly, and Borg[61] (1989)	Assess the effects of a holistic treatment strategy for reducing reacher stress.	*****	30 middle and high school teachers	Teachers were recruited in faculty meetings and those with high levels of stress were selected (66% female).	No treatment
Fiedler Vivona-Vaughn, and Gochfeld[62] (1989)	Compare the effectiveness of combined training in PMR, CSM, and ROM for lowering blood pressure.	*****	66 state employees	Not reported (23% female).	Wait list

Table 1, continued

Evaluation Period	Outcome Measures	Research Design	Findings
17 weeks; 9 months	Blood pressure	Workers received training in PMR during 8 sessions over a 10-week period. The control group simply had their blood pressure monitored at the same time as the trained group. Workers in the trained group were encouraged to practice the stress management skills at home, and to keep a record of their practice schedule.	Both PMR and control groups had significantly lower blood pressure after training, but the PMR groups had significantly larger reductions. At 6 months, 12 months, and 30 months, there were no differences between groups, However, the PMR group had a larger proportion of people whose posttraining diastolic blood pressure was 90 mm Hg or less than controls, and this effect was present throughout the entire follow-up period.
8 weeks; 6 weeks	Pulse rate; blood pressure; GSR	Workers were trained in either COG-BEH, meditation-relaxation, or exercise. Groups met for 8-10 hours during the first week to learn the stress management techniques. After 8 weeks, each group was split and learned one of the other techniques.	Taken together, the three treatment groups showed lower pulse rates and systolic blood pressure at the 8-week posttraining assessment compared to controls. Each technique was associated with lower pulse rates, but no one technique was found to be superior to the others. Learning multiple methods produced significant effects for pulse,but no one combination of methods was better than another.
10 weeks; 30 months	Blood pressure	Training groups included PMR, PMR+COG-BEH, PMR+BIO, PMR+BIO+ COG-BEH, and others. Training consisted of 13 50-minute sessions, and home practice. Five follow-up visits over the next 3 years also were held.	Workers in all groups (including controls) showed significant decreases in blood pressure after training and at follow-up. Among the various training, COG-BEH training was especially effective in lowering blood pressure. However, the control group also showed significant reductions in blood pressure after training and at follow-up, which raised the issue of nonspecific effects.
8 months	General well-being; coping ability; task performance (e.g., Morse code receiving)	Officers were taught by platoon leaders (who received two 4-hour training sessions). Training consisted of PMR + meditation.	Cadets who received stress management training exhibited improvements in task performance (Morse code receiving and right hemisphere brain functions), and improved coping ability compared to controls. No effects of were found on reported well-being.
8 weeks; 3 months	Blood pressure; anxiety (STAI); depression (BDI); coping ability; work stress; job satisfaction	Workers were trained in small groups that met for 8 to 10 weekly 90-minute sessions. One group received training in PMR, another COG-BEH + PMR. The control group received information about stress, but no specific stress management skills were taught.	All groups displayed lower anxiety, depression, and hostility at follow-up; there were no differences between groups. No differences were found for blood pressure, job satisfaction, or work stress. The COG-BEH + PMR group showed an *increase* in diastolic blood pressure at follow-up compared to baseline. The skill-based interventions (PMR and COG-BEH) were not better than controls for lowering stress symptoms. Nonspecific factors were highlighted.
4 weeks; 4 months	Personal awareness; coping ability; general knowledge	Workers were trained during weekly 3 hour meetings. They were provided with information about stress and coping skills, and were taught PMR.	Trained groups displayed significant improvements on all knowledge and ability measures post-training. These effects were still present at the 4-month follow-up, though at reduced levels.
1 day; 5 months	Anger inventory; use of emergency restraint	Workers in the COG-BEH group received training in a 1-day workshop. Attention control group received 1 to 2 hours of training.	Scores on anger inventory were lower after COG-BEH training than attention control training. Follow-up evaluation revealed that participants felt the training was useful. Use of emergency restraint was lower in the 5-month period after training than the 5-month period before training.
8 weeks; 8 weeks	Anxiety (STAI); teacher stress; coping skills; cardiovascular fitness	One group of teachers received COG-BEH training plus 0.5 hour of physical exercise during 8 weekly 0.5-hour sessions. The minimal exercise group later received COG-BEH training.	The COG-BEH group reported lower anxiety and stress levels than controls, both after training and at follow-up. The minimal exercise group did not show any changes after training. No changes were found on measure of cardiovascular fitness.
Not reported	Structured interview; perceived stress; job stressors; job strain; coping resources	Teachers learned breathing exercises, PMR, MED, and coping skills during 12 2-hour sessions.	The multifaceted training resulted in lower stress levels than controls on 23 of the 39 different measures. The control group showed a significant decrease on one stress measure.
9 weeks	Blood pressure	Workers met in small groups for nine 1.5 hour sessions during which they were taught PMR + CSM + ROM techniques.	The trained group did not show lower blood pressure than controls, but did show lower variability of diastolic pressure blood after training. Among those assessed as 'high stress reactors,' systolic blood pressure was lower among trained than control workers.

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Table 1, continued

Study	Purpose of Evaluation	Research Design Rating	Sample Size	Sample Description	Comparison Group
Vaughn, Cheatwood, Sirles, and Brown[63] (1989)	Determine if PMR is effective in reducing stress of clerical workers.	*****	20 clerical employees	Letter of invitation was sent to all employees via interoffice mail, and a free lunch on company premises was offered (100% female).	Wait list
Barkum and Shapiro[64] (1990)	Compare the feasibility of brief psychotherapy for reducing job-related stress.	***	12 white collar employees in Great Britian	Employees with mild depression were referred for therapy by general health practitioners. (% not reported)	None
Cecil and Forman[65] (1990)	Compare the efficacy of stress management training with coworker support for reducing teacher stress.	*****	54 elementary and middle-school teachers	Teachers were recruited at a faculty meeting (96% female).	Wait list
Goodspeed and DeLucia[66] (1990)	Compare two stress management programs for reducing worker strain.	***	148 employees in various occupations	Employees were notified of the stress management program; 113 choose the Time-Life stress management series, and 35 chose the Myer-Briggs program (73% female).	None
Larsson, Setterlind, and Starrin[67] (1990)	To evaluate a stress management program which can be implemented in a work setting without the aid of specialists.	****	89 high school teachers in Sweden	High school teachers formed 9 "health circles," and were asked to form "circles" at their respective schools. They received instruction in 2 4-hour workshops held 4 weeks apart (75% female).	Nonequivalent controls
Stachnik, Brown, Hinds, Mavis, Stoffelmayr, Thornton, and Van Egeren[68] (1990)	Evaluate the feasibility of a stress management training program for changing poor health habits.	***	21 university faculty and staff	Faculty and staff were recruited at a health fair offered at the university. (% not reported)	None
Kunkler and Whittick[69] (1991)	Evaluate the effectiveness of stress management training for nurses.	***	21 nursing staff in psycho-geriatric ward (Scotland)	All hospital nurses were administered a general health questionnaire and a burnout inventory. (% not reported)	None
McCue and Sachs[70] (1991)	Evaluate the effectiveness of a single stress management workshop for young physicians.	****	64 medical and pediatric residents	Residents were recruited for the stress management program at their weekly business meeting; the departmental program directors strongly urged participation (44% female).	Residents who could not be released to receive training
Firth-Cozens and Shapiro[71] (1992)	Evaluate the effects of brief psychotherapy on job perceptions and stress symptoms.	***	90 white collar workers in Great Britian	Workers were participating in an ongoing treatment program to relive job stress (46% female).	None
Francis and Pennebaker[72] (1992)	Assess the benefits of writing about traumatic events on biologic functioning, absenteeism and subjective well-being.	*****	43 university employees	Workers who were participating in an ongoing wellness program were recruited for the study (91% women).	Control group wrote about trivial topics
Gronningsaeter, Hytten, Skauli, Christensen, Ursin[73] (1992)	Compare the effectiveness of aerobic exercise and stress inoculation training on physically inactive employees.	*****	76 insurance company employees (Norway)	Employees were recruited via a health screening program. Inactive employees (exercise less than 45 minutes once per week) were invited to participate in the study (55% female).	Wait list

Table 1, continued

Evaluation Period	Outcome Measures	Research Design	Findings
4 weeks	Stress symptoms; negative stress responses	Workers attended a workshop and were given a PMR audio tape for home practice. Employees were asked to practice PMR 3 days per week for 4 weeks.	The PMR group reported significantly fewer negative responses to stress and fewer stress symptoms after training than controls.
2 weeks; 3 months	Depression (BDI); psychiatric symptom checklist (SCL90R)	Workers received 2 weekly sessions involving either COG-BEH or psycho-dynamic therapy.	Posttherapy depression scores were lower than presession scores; the changes were maintained at follow-up. No differences between therapeutic techniques was found.
6 weeks; one month	Stress symptoms; teacher stressors; behavior observation	Workers met weekly for 90-minute sessions for 6 weeks. One group was taught COG-BEH, while the other focussed on developing coworker support.	The COG-BEH group showed significant reductions in reported stress and stress symptoms after training and at follow-up. The coworker support group did not differ from controls on measures of stress.
5 weeks; 6-8 months	Stress symptoms (cognitive, behavioral, and physical)	Workers in the Time-Life Program received 5 90-minute weekly lunch-time seminars; Workers in the Myers-Briggs program received 2 4-hour workshops.	Stress symptoms were lower for both groups at follow-up compared to baseline. There were no differences between the training groups. (No data were collected immediately after training).
2 weeks; 6 months	Stress symptoms (emotional, behavioral, and physical); daily hassles; mood state	Members of the health circles received a cassette tape containing muscle relaxation and other stress management exercises. Each circle met 5-8 times per week for 1-3 hours per session.	Workers in the health circles reported fewer work stressors, better coping, improved health, and fewer physical and emotional stress symptoms 2 weeks after training than controls. At the 6-month follow-up, trained workers did not differ from controls in the frequency of attempts to reduce stressors at work.
6 months	Coping abilities; daily hassles (Hassles Scale); self-consciousness; social anxiety	Workers received training during 13, 1-hour sessions, which met weekly at first, then less often. Training involved PMR and COG-BEH, goal setting, social support, and financial incentives.	After training, there were small changes on measures of lifestyle coping, daily hassles, self-consciousness, and social anxiety, but only changes on the latter measure were statistically significant. Workers met over 80% of their weekly personal goals.
14 weeks	Burnout; stress symptoms (GHQ)	Nurses participated in stress workshops administered once every 2 weeks. Training included education about stress and health, setting of realistic goals and adaptation strategies, and muscle relaxation exercises.	After training, nursing staff reported fewer symptoms of burnout, and improvements on other stress symptoms. Increases in support-seeking and better relationships between doctors and nurses were also reported after training.
1 day: 6 weeks	Burnout; work stressors; work satisfaction; support seeking; stress symptoms (emotional, physical, behavioral)	Residents were trained in a single 4-hour workshop held during normal work hours. The workshop covered personal management skills, relationship skills, COG-BEH, and PMR. Breakfast and lunch were provided.	Trained residents reported lower burnout (emotional exhaustion), fewer emotional and behavioral symptoms, and more support-seeking than untrained residents. The results supported the value of an inexpensive, brief stress management training workshop for medical residents.
16 weeks	Psychiatric symptom checklist (SCL90R) Anxiety (STAI); job perceptions; job satisfaction	Workers were followed before and after receiving therapy. The training involved COG-BEH and/or psycho-dynamic therapy. No differentiation between therapies was made in this article.	Job perceptions improved significantly, job satisfaction increased, and stress symptoms became less frequent after training. Workers perceived their jobs as involving more opportunities for control, skill use, and interpersonal contact. The changes in job perceptions were correlated with changes in stress symptoms.
6 weeks; 6 months	Blood assays; absenteeism; positive affect; negative affect	Participants met for 20 minutes, once a week for 4 weeks at the health center, to write about either trivial events or traumatic experiences.	All blood assay results (except cholesterol) were in a healthier direction after training for those who wrote about traumatic experiences than about trivial events. Absenteeism rates were lower in the traumatic group than the trivial group 3.5 months later. No group differences in reported well-being were found.
10 weeks; 6 months	Cholesterol; muscle pain; anxiety (STAI); coping ability; aomatic complaints; job satisfaction	Participants received either aerobic exercise, stress inoculation training (COG-BEH + PMR), or no treatment. Both treatment groups met for 55 minutes twice per day for 3 days per week over 10 weeks.	Aerobic exercise resulted in improved feelings of well-being and job satisfaction and decreased complaints of muscle pain. Stress inoculation training resulted in improved coping ability, but no significant changes in somatic or psychologic health, but significant improvements in reported coping ability.

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Table 1, continued

Study	Purpose of Evaluation	Research Design Rating	Sample Size	Sample Description	Comparison Group
Pruitt[74] (1992)	Evaluate the effectiveness of a multi-modal stress management program.	*****	64 civilian Pentagon employees	Employees who participated in a general health promotion program and who had high blood pressure were invited to participate (47% female).	Wait list
Alexander, Swanson, Rainforth, Carlisle, Todd, Oates[75] (1993)	Evaluate the effects of Transcendental meditation (TM) technique on stress reduction, health, and employee development.	****	86 white collar employees of auto industry manufacturing plants and sales offices	Workers volunteered to participate in the training program or to serve as controls. (% not reported)	Matched controls
Reynolds, Taylor and Shapiro[76] (1993)	Assess specific and nonspecific effects of stress management training.	***	62 health service providers in Great Britian	(100% female)	None
Reynolds, Taylor and Shapiro[77] (1993)	Assess the impact of stress management training on measures of psychotherapeutic process.	***	92 health service workers in Great Britian	Workers were recruited via requests to line and departmental managers (100% female).	None
Robinson and Mitchell[78] (1993)	Explore the value of post-traumatic psychologicdebriefing sessions on the prevalence of stress symptoms.	***	288 emergency service, welfare, and hospital workers in Australia	All workers who experienced traumatic events were contacted by the Australian Emergency Services Team for inclusion in the study (48% female).	None
Toivanen, Helin and Hanninen[79] (1993)	Investigate the effect of relaxation training on work/time lost due to neck/shoulder tension.	*****	50 hospital cleaning staff in Finland	No additional information was reported on the sample (100% female).	No treatment
Toivanen, Lansimies, Jokela and Hanninen[80] (1993)	Investigate the effect of brief relaxation training on autonomic nervous system function and coping ability, and evaluate the motivational effects of guided training/practice vs. self-training/ practice.	*****	50 hospital cleaning staff and 50 bank employees in Finland	Workers were recruited during normal occupational meetings of these groups at the worksite (100% female).	No treatment
Tsai and Crockett[81] (1993)	Assess the effectiveness of relaxation training for helping nurses reduce perceptions of stress, and stress symptoms.	*****	137 nurses in China	Nurses from three hospital were randomly selected and asked to participate in the study (99% female).	Lecture and discussion
Doctor, Curtis and Isaacs[82] (1994)	Examine the feasibility of a stress counseling program for police officers.	*****	61 police officer in Great Britian	Officers were selected from those who returned a stress questionnaire sent to all officers in the district (100% male).	No treatment
Freedy and Hobfoll[83] (1994)	Compare the efficacy of 2 stress management programs for reducing nurse stress levels.	****	87 nurses	Staff nurses were recruited from 6 acute care facilities in Ohio via announcements at staff meetings (100% female).	Delayed treatment
Vines[84] (1994)	Study the effects of training in PMR + guided imagery on worker stress symptoms.	****	68 workers in 4 corporations	Workers at each of the sites were recruited via informational sessions which described the stress management program (63% female).	Wait list

Table 1, continued

Evaluation Period	Outcome Measures	Research Design	Findings
1 month	Blood pressure; axiety (STAI); psychiatric symptom checklist (SCL90R)	Workers were provided with information about stress and were taught relaxation techniques, assertiveness and time management. A relaxation tape was given to workers for home practice. Other details about the training were not reported.	Trained workers reported fewer stress symptoms after training compared to controls, but there were no statistically significant differences between groups on blood pressure or anxiety.
4 days; 3 months	Skin conductance; anxiety (STAI); job tension; general health; sleep difficulties; job satisfaction	Employees learned TM during 1-hour sessions held on 4 consecutive days, and were asked to practice TM twice daily. Weekly meetings were held to assess progress, plus 2 weekend seminars.	During the 3-month follow-up, employees who practiced TM regularly had lower skin conductance levels than controls; smaller effects were seen in workers who irregularly practiced TM. Regular meditators also had lower post-training levels of trait anxiety, sleep difficulties, job tension, and job satisfaction than controls.
6 weeks	Session impact: (power, value, comfort, safety, mood); session evaluation: (helpful vs hindering)	Workers received 6 weekly sessions during which a different component of stress management training was offered. Components included education, muscle relaxation, assertiveness, COG-BEH, time management, and social support. Workers rated session evaluation and impacts after each component.	Different components of the stress management training resulted in distinctive ratings of session impact. The ratings of participants who received SMT were similar to clients of cognitive-behavior therapy but different from clients receiving psychodynamic or interpersonal therapy.
1 month	Psychologic distress; job satisfaction	Standardized sessions of stress management training, each of which contained specific techniques	Workers reported significantly lower levels of psychologic distress, but no changes in job or non–job satisfaction after training. Task impacts (e.g., insight and problem definition), and nonspecific impacts (e.g., support) were related to non–job satisfaction one month later.
2 weeks	Stress symptoms; value of debriefing session	Workers participated in a single 2-3 hour group debriefing session conducted within 72 hours of the traumatic event. The session focused on discussions about the event, and the coping skills used to deal with it.	Two weeks after the debriefing session workers reported that the session was useful, and helped them cope with the post-traumatic stress reactions. They also reported a lowering of the impact of the traumatic event after debriefing.
3 months; 6 months; 1 year	Trapezius muscle; activity of the dominant hand; depression (BDI); subjective feelings; absenteeism	Workers were taught a 15-minute relaxation program (PMR+ deep breathing) and were asked to practice daily. The intervention was performed in guided meetings with workers held 3 times per week for 3 months.	The trained group showed significant decreases in muscle tension levels, nervousness and sleeping disorders after training compared to controls. Absenteeism was reduced among workers in both trained and control groups at both the 6 month and 1-year follow-ups.
3 months; 6 months	Cardiac ANS function; stress and coping interviews	Workers were taught a 15-minute relaxation program (PMR+ deep breathing) and were asked to practice daily in a controlled setting. Hospital employees received the training during guided meetings held 3 times per week for 3 months. Bank employees were simply asked to practice the relaxation daily.	Brief relaxation training resulted in positive changes on all cardiac ANS functions compared to untrained controls 3 and 6 months after training. The effects were most pronounced for the guided training compared to those who were asked to practice the relaxation on their own. Guided training provided the motivation necessary for participants to practice regularly.
2 weeks; 3 weeks	Stress symptoms; job stress levels	Nurses participated in 2 weekly 90-minute sessions and were taught PMR + MED and COG-BEH techniques.	Nurses reported fewer stress symptoms and lower job stress levels after training. The effects also were evident at follow-up.
12 weeks; 12 weeks	Stress symptoms; absenteeism	Officers received 12 1-hour counselling sessions during which they were encouraged to ventilate their feelings about police work, share stressful experiences and establish a healthy group culture.	No differences between counselling and control groups were found in stress symptoms or absenteeism after training nor at follow-up. There was a nonsignificant trend for officers in the counselling group to show lower absenteeism during the 12-week counselling program.
5 weeks; 5 weeks	Emotional exhaustion; depression; social support or mastery	Nurses learned either single (mastery) or dual (social support plus mastery) resource training during 5 weekly 75-minute COG-BEH training sessions.	Nurses with low initial levels of social support or mastery experienced the largest reductions in depression after dual resource training. The reductions in depression were from above normal before training to within normal range after training. Dual resource training was more effective than the single resource intervention.
9 weeks; 20 weeks	Psychiatric symptom checklist (SCL90R); health-seeking behaviors	Training was done in groups of 3-12 workers. Workers were taught relaxation-guided imagery during 6 weekly 1-hour sessions. A tape was provided for home practice and workers were asked to practice twice daily.	The only statistically significant differences found between trained and control groups were in the opposite direction (i.e., the control group demonstrated larger changes than the trained group). Based on anecdotal findings, the authors concluded that relaxation with guided imagery may be helpful to some individuals.

Training sessions usually lasted an hour or more and were offered on a weekly basis. They ranged from a few days of training to programs lasting many weeks. Small-group formats were most common.

Table 2 presents a summary of the 64 studies grouped according to the stress-management intervention technique used. Thirteen studies (20%) used muscle relaxation as a primary intervention, 13 used cognitive-behavioral training, six used meditation, and four used biofeedback. Seventeen studies (26.6%) used other techniques, such as posttraumatic debriefings or psychodynamic therapy. The most common intervention in worksite studies was a combination of two or more techniques (30 of 64 studies), usually muscle relaxation plus cognitive-behavioral training. Seventeen studies (26.6%) compared the relative effectiveness of two or more stress-management techniques, whereas the remainder tested single techniques.

Methodologic Critique

Table 3 summarizes the methodologic aspects of the stress-management studies. Generally speaking, the studies receive high marks on most of the methodologic criteria. Nearly 90% of the studies used reliable and valid outcome measures, in the form of a physiologic/biochemical measure or a validated self-report measure. Appropriate statistical analyses of the data were performed in 80% of the studies; the remaining 20% either did not use statistical analyses or did not use accepted statistical conventions in the data analysis. Examples of the latter would be the use of paired *t*-tests or analyses of variance (ANOVA) instead of analyses of covariance (ANCOVA) or multiple regression analyses to adjust posttraining results for pretraining levels.

Nearly 75% of the studies had sample sizes of 20 or more workers in the trained group. Among the 34 studies with the highest research rating (see Table 1 for description of research ratings), the average sample size was 33 workers per group (range= 5 to 118 workers/group). More than half (60%) of the studies included some type of posttraining follow-up assessment, but only four extended the follow-up to a full year after training. Finally, about 25% of the studies compared different stress-management techniques, and no single technique emerged as consistently superior to another. Three methodologic criteria from Table 4 deserve special mention: research rating, nonspecific effects, and program orientation.

Table 2

Types of Stress-Management Interventions Used in the 64 Studies Reviewed

Stress-Management Technique	No.	%
Muscle relaxation (PMR)	13	20
Meditation (MED)	6	9
Biofeedback (BIO)	4	6
Cognitive-behavioral (COG-BEH)	13	20
Combination of methods (COMB)	30	47
PMR + COG-BEH	13	43
PMR + COG-BEH + OTHER	9	30
PMR + BIO + OTHER	4	13
PMR + OTHER	4	13
Other methods (OTHER)	17	27

Note: Numbers add to more than 64 because many studies used more than one stress-management intervention.

Table 3

Summary of Methodologic Aspects of 64 Stress Management Studies

	No.	%
Preventive (vs treatment) orientation	47	73
Included some type of follow-up:	37	58
6 mos to 1 year	15	23
1 year or more	4	6
Compared different intervention techniques	16	25
Found effects for control groups (n=50 possible)	29	58
n=20 or more subjects in trained group	47	73
Reliable/valid measures used	57	89
Objective measure(s) included	31	48
Appropriate/complete statistical analyses	51	80
AJHP Research Rating:		
* (descriptive, anecdotal evidence)	0	0
** (no randomized controls, no evaluation and no intervention)	1	2
*** (no randomized controls, but includes evaluation)	14	22
**** (properly conducted study, but no randomization)	15	23
***** (properly conducted study, with randomized controls)	34	53

Research rating. Just over half the studies received the highest research rating, that is, were true experiments with random assignment of workers to training and control groups. This percentage is similar to that reported in a prior review of the literature.[19] About a quarter of the studies did not use a control or comparison group, and the same fraction used a control group but did not randomly assign workers to training and control groups. It is noteworthy that the probability of a study reporting positive, beneficial results varied inversely with its research rating. Ninety percent of the studies that rated three stars (no control group) reported positive results, compared with 80% of the studies rated four stars, and 68% of the studies with a 5-star rating.

Nonspecific effects. Of the 50 studies that used control/comparison groups,

29 (58%) found significant effects on outcome measures for the control groups as well as the trained groups, and in 12 studies, the authors noted that nonspecific factors contributed to the obtained results. The issue here is whether the outcomes result from specific aspects of stress-management training or from nonspecific factors such as sitting in a comfortable chair, receiving time off from work to participate in training, or simply learning more about stress and its effects on the body. The problem of nonspecific effects is not new to this research area; previous literature reviews of the stress-management literature noted that nonspecific effects were common in stress-management studies.[19,20] The existence of nonspecific effects requires that control/comparison groups be used in all future studies.

Program orientation. Nearly 75% of the stress-management interventions in work settings were offered to all workers, not just to those under high levels of stress. In contrast to clinical treatment settings where patients have debilitating anxiety or painful muscle-tension problems, most participants in worksite stress-management studies enter the training with subclinical levels of stress. This fact has implications for evaluations of health effects of stress-management training. For example, it is more difficult to demonstrate a statistically significant decrease in anxiety in participants who enter the training with normal levels of anxiety than in participants who enter with very high levels. This logic is used in many studies where the observed reductions in physiologic or psychologic measures did not reach statistical significance. The 64 studies reviewed in this article were grouped according to whether the training was preventive (i.e., offered to all workers) or treatment-oriented (i.e., workers experiencing high stress were recruited for training). Analyses indicated that 79% of the prevention-oriented studies reported positive results, compared with 94% of the treatment-oriented studies.

Health Effects of Stress-Management Interventions

The wide array of health-outcome measures, coupled with the diversity of techniques used in stress intervention studies, makes it difficult to summarize the health effects. To facilitate the summary of results, the various health outcomes were grouped into four categories: physiologic/biochemical, psychologic/cognitive, somatic, and job/organizational, as shown in Table 4. In successive columns, the table shows the number of times each intervention was used in the 64 studies, the number of times each health outcome was measured, and the percentage of instances in which positive effects were reported. Thus the first row of Table 3 shows that 13 studies used muscle relaxation; six of these measured physiologic outcomes, and 83% of these (five of the six studies) reported significant results. Because of the small number of studies using biofeedback and meditation, the percentages for these interventions should be interpreted with caution.

Physiologic/biochemical. Physiologic measures included adrenaline, noradrenaline, and cholesterol levels, but the most common measure was blood pressure. Blood pressure was measured in 13 studies but, because five of these studies evaluated two or more techniques, there are a total of 20 assessments of the effects of stress interventions on blood pressure. Of the 20 assessments, eight involved a combination of training techniques, four used muscle relaxation, three used cognitive-behavioral skills training, two meditation, one biofeedback, and two used "other" methods.

At first glance, the effects of stress interventions on blood pressure seem quite positive. Only four of the 20 assessments reported insignificant effects of stress-management interventions on blood pressure; the remainder found significant changes in systolic/diastolic blood pressure, ranging from a low of 4 mm Hg/1 mm Hg to a high of 21 mm Hg/12 mm Hg (systolic/diastolic). However, closer inspection of the results reveals a less positive picture. For example, the studies reporting the largest decreases in blood pressure after training [24,32,53] also reported large and significant reductions in control/comparison

Table 4

Summary of Effects of Stress-Management Interventions on Outcome Measures

		Health-Outcome Measure								
		Physiologic/ Biochemical		Psychologic/ Cognitive		Somatic Complaints		Job/ Organizational		
Training Method	Total (N)*	n	% Positive	n	% Positive	n	% Positive	n	% Positive	Average
Muscle relaxation (PMR)	13	6	83	8	50	6	33	4	25	47.8%
Meditation (MED)	6	3	100	3	100	3	100	3	100	100.0%
Biofeedback (BIO)	4	3	60	2	0	2	0	3	0	15.0%
Cognitive-behavioral (COG-BEH)	13	4	50	10	100	3	100	5	80	82.5%
Combination of methods (COMB)	30	13	62	21	76	13	85	11	64	71.8%
PMR + COG-BEH	15	7	57	11	73	6	83	6	67	70.0%
Other methods (OTHER)	17	4	50	12	77	8	75	6	83	71.3%
Average	83	33	67.5%	56	67.2%	35	65.5%	32	58.7%	

* N = number of times the techniques was assessed. Many studies used more than one technique, so the total adds to more than the 64 studies reviewed.

groups. In one case,[32] the control group received health education information, whereas in another, the control group simply sat quietly without instructions.[24] Perhaps the most telling evidence comes from a study that used blood-pressure monitoring as a control condition over a 9-month study period.[53] The authors found that monitoring of blood-pressure alone resulted in blood pressure reductions of 8 mm Hg/6 mm Hg, compared to reductions of 10 mm Hg/10 mm Hg for the group that received stress-management training. The small difference between training and control groups raises questions about the true value of stress-management training for decreasing blood pressure. Over all the 20 assessments, the average decrease in blood pressure after training was 7.8 mm Hg/5 mm Hg; the average decrease for control groups was 4.9 mm Hg/2.7 mm Hg. The results suggest that stress interventions have a minimal unique effect on worker blood pressure.

Other physiologic measures were used too infrequently to draw firm conclusions. These included muscle-tension levels; levels of catecholamines (adrenaline and noradrenaline), plasma renin, angiotensin and aldosterone; plasma cholesterol; cardiac function; and pulse rate. It is noteworthy that all three studies that measured catecholamines found beneficial changes after stress-management training,[34,45,92] and that two of the three studies used a combination of stress-management techniques as the main training strategy.[34,45] Likewise, positive results for muscle-tension levels were found in five of the seven assessments,[29,40,41,46,70] and all three studies that used a combination of techniques reported positive changes after training.[29,46,70]

Psychologic/cognitive. Unlike the blood-pressure data, the psychologic outcome data were not amenable to easy interpretation because of a lack of normative data and the variety of different assessment measures (e.g., anxiety, depression, irritability). However, 16 studies used the State-Trait Anxiety Inventory (STAI)[91] as a measure of anxiety, and five of those studies compared more than one type of intervention, resulting in a total of 21 assessments of anxiety after stress-management training. Examination of these studies revealed that the average pretraining anxiety level was 41.17, the average posttraining level was 35.91, and the net reduction in anxiety levels was about 5.00. Among control groups, the average net reduction in anxiety was less than 1.00. Unlike the blood-pressure results, these results support the conclusion that the effect of stress-management training on anxiety levels is specific to the training and not a result of nonspecific factors. Other psychologic measures, such as depression and irritability, were used too infrequently to allow firm conclusions to be drawn.

Somatic complaints. There was little standardization of measures of somatic complaints in the studies reviewed. Typically, authors used a checklist of somatic symptoms (e.g., nervousness, trouble sleeping, headaches, muscle tightness, shortness of breath) and asked participants to indicate how often they experienced each symptom in the past month. The general lack of uniformity in measures of somatic complaints makes direct comparisons of the results difficult. In all, 26 studies used some type of somatic complaint measure. About 60% of these reported significant reductions in somatic complaints after stress-management training, but half of these studies did not use a control group. Seven studies used a well-standardized symptom checklist scale, the Symptom Checklist 90 (Revised),[92] and of these, only two[26,71] found statistically significant reductions in somatic symptoms after training. The effects of stress-management training on somatic complaints remain equivocal.

Job/organizational. Only 40% of the studies included an assessment of organizational outcomes, and most of these measured self-reported job satisfaction. The low frequency of organizational outcome measures is probably caused by the fact that stress-management interventions focus on changing the worker, not the work environment, and the choice of outcome measures simply reflects this bias.

Job satisfaction was measured in 12 studies (17 assessments), and about two-thirds reported no changes in job satisfaction after stress-management training. Of the six assessments that found increases in job satisfaction after training, none were randomized, controlled experiments, and half did not use a control or comparison group. None of the randomized, controlled studies found increases in job satisfaction after training.[41,46,57,73] It appears that stress-management interventions have little effect on job satisfaction.

Health-care costs and clinic visits were assessed in three studies, and all of these studies found significant decreases after stress-management training.[29,40,44] These findings are important because health-care costs are crucial bottom-line indicators for companies. Interestingly, all three of these studies used a combination of stress-management techniques as the intervention strategy. However, only one of these studies was a randomized, controlled study. With respect to other job/organizational measures, five studies reported lower absenteeism after training,[35,42,51,72,79] and three studies found no changes in absenteeism.[50,51,82] Once again, though, of the five studies that reported lower absenteeism after training, only two were randomized, controlled studies.

Which Stress-Management Strategies Work Best?

Stress-management interventions differ from other health promotion programs in the variety of training techniques and wide range of health-outcome measures used to assess program effectiveness. To facilitate summarization of results, stress-management techniques and health-outcome measures were grouped into discrete categories. This exercise produced six categories of interventions and four categories of outcomes, or a 6 × 4 (24-cell) matrix. However, the large number of categories (24 cells) relative to the number of studies reviewed (N = 64) precluded a detailed, cell-by-cell analysis of the health effects of stress-management interventions. The results for each technique are summarized below, with an indication of the amount and

quality of supporting evidence. Refer back to Table 4 for details.

Muscle relaxation training seemed to produce significant effects on physiologic outcomes and little change on other outcome measures. This result is consistent with the focus of training on somatic aspects or symptoms of stress. Five of the 6 studies showed significant posttraining effects on physiologic outcomes (e.g., blood pressure, muscle activity levels). Perhaps because of its restrictive focus on somatic aspects of stress, muscle relaxation was progressively less effective in producing changes on psychologic, somatic, and organizational outcomes. Muscle relaxation was often used in combination with one or more other stress-management techniques, as noted later in this article.

Six studies examined meditation as the primary stress intervention technique, and four of the six were randomized, controlled trials. The sparseness of studies is complicated by the fact that no one outcome measure was used in all of the studies. Thus for any one outcome measure, data from only three studies were available for assessing effects: far too few to draw firm conclusions. Nevertheless, inspection of Table 4 reveals that meditation produced significant effects on *all* outcome measures.

As the main intervention technique, biofeedback was used least frequently of all interventions, and its effects on most health-outcome and job/organizational measures were unremarkable. Biofeedback produced changes in physiologic outcome measures in 60% of the studies, which attests to the value of the technique for helping workers learn to control their physiologic responses. However, the empirical evidence does not support the use of biofeedback as a worksite intervention. Moreover, the cost of biofeedback equipment and the need for certified personnel to administer the training further argue against biofeedback as a worksite intervention technique.

Cognitive-behavioral skills training was the single intervention technique used most frequently in stress-management studies (n=13), and produced the most consistent effects on psychologic outcomes, especially anxiety. This is not surprising given that this training focusses on understanding and altering the cognitive aspects of stress (i.e., thinking patterns) and acquiring stress-coping skills. This training also seemed to produce effects on job/organizational outcomes (e.g., job satisfaction), perhaps by helping workers deal with irrational thoughts ("everything I do must be perfect"), thereby improving job satisfaction. However, only two of the five studies that assessed job/organizational outcomes were randomized, controlled trials, and so caution is warranted in interpreting these results. Finally, cognitive-behavioral skills training produced only mediocre effects on physiologic outcomes, although only four studies assessed physiologic outcomes after training.

Thirty of the 64 studies reviewed in this article used a combination of stress-management techniques, and these studies seemed to produce the most consistent, significant results across the various health-outcome measures. As shown in Table 4, combination strategies produced significant effects on *each* health outcome measure (60% of studies or more). Significant results were also seen on job/organizational measures in more than 60% of these studies. The most common combination of techniques was muscle relaxation plus cognitive-behavioral skills training. Conceptually, the combination of these two techniques creates a dual focus on cognitive and somatic aspects of stress, and additionally involves the development of specific coping techniques. It appears that this particular blend of training techniques is the most effective type of stress-management intervention.

The interventions in the *other* group produced consistent results on all outcomes except physiologic measures. However, because this category included a wide diversity of techniques, such as posttraumatic debriefings and psychodynamic therapy, any summary statement for this category would be difficult to interpret in a meaningful way. It should be noted that techniques in the *other* category differed importantly from the other stress-management techniques in being focused on one specific problem (e.g., coping with a traumatic event).

In conclusion, stress-management interventions that involved a *combination* of training techniques produced more consistent results across the various health-outcome measures than individual techniques. The reason for their superiority may be two-fold. First, the combination of muscle relaxation and cognitive-behavioral skills training provides workers with a balance of somatic and cognitive skills, and this combination may be more effective across more types of outcome measures than either technique alone. For example, muscle relaxation alone was effective for physiologic outcomes and cognitive-behavioral skills training was effective for psychologic, so the combination of the two should increase the overall range of effective results. A second possible reason for the effectiveness of combination training is that because more than one skill is taught, there may be fewer participants who fail to learn the stress-management skills. In the empirical studies that reported the success rates of participants, it was common to find that about one-third of participants failed to learn a particular stress-management technique.[20]

If one were to assess the efficacy of stress-management techniques for each outcome measure separately, instead of considering all outcomes together, then a different picture emerges. Thus in the case of physiologic outcomes, the most effective technique seems to be muscle relaxation, whereas for psychologic symptoms, cognitive-behavioral skills training appears to be the most effective. For somatic complaints, a combination of stress-management techniques seems most effective, and for job/organizational outcomes, narrowly targeted techniques as found in the *other* category are most effective (e.g., traumatic stress debriefing).

Rating for the Literature as a Whole

As noted in the lead article to this special issue of the JOURNAL, five categories are used for rating the stress-management research literature as a whole: *conclusive, acceptable, indicative, suggestive,* or *weak.* Providing a single rating for the entire literature

is difficult because (1) many different interventions and measures of health outcome were used, (2) the stress-management techniques produced differential effects across outcome measures, and (3) the effects of training often were very small, although statistically significant. Adding to the difficulty is the fact the these types of interventions are particularly sensitive to process factors, that is, issues surrounding *how* the intervention was implemented and characteristics of the work environment in which it was implemented—information that was not often contained in research studies. Despite these difficulties, the stress-management literature is given an overall rating of *indicative.* However, if the review is restricted to studies involving a combination of muscle relaxation plus cognitive-behavioral skills techniques, then the overall rating would increase to *acceptable.*

SUMMARY

The steady number of worksite stress-management intervention studies published in the literature since 1980 suggests that, as a worksite issue, stress is here to stay. Emerging changes in the work environment (e.g., downsizing and reorganization, flexiplace arrangements, total quality management) and changes in workforce demographics (e.g., cultural diversity) signal that job stress will increase or at least continue to be a problem in the near future. Increasingly, companies will seek effective interventions to reduce employee stress, lower health-care costs, and improve productivity.

Stress-management interventions reviewed in this article made use of a variety of training techniques and evaluated effects on a range of health outcomes. The effectiveness of stress-management interventions varied according on the type of outcome measured. For example, cognitive-behavioral skills interventions seem effective in reducing psychologic symptoms of stress, and muscle relaxation has its main effects on physiologic indicators (i.e., muscle activity). Combinations of individual techniques, especially the combination of muscle relaxation and cognitive-behavioral skills training, were the most common type of stress-management intervention in the published literature, and generally were the most effective intervention *across* all types of outcome measures.

None of the individual interventions were consistently effective in producing effects on job/organization-relevant outcomes, such as absenteeism or job satisfaction. This is not surprising in that none of the interventions focused on changing job-related sources of stress. Two exceptions to this statement are noteworthy. First, some of the interventions in the *other* category specifically focused on job-related sources of stress (e.g., traumatic stress debriefing), and this accounts for the observed superiority of the *other* category in producing changes in job/organizational outcomes. Second, of the individual stress-management techniques, cognitive-behavioral skills training produced changes in job/organizational measures (75% of studies), although many of these studies were not randomized, controlled trials. This finding seems significant and suggests that at least some portion of job stress involves worker cognitions about the job that are amenable to change.

The literature on meditation as a stress-management technique is particularly striking, in that meditation produced significant results on *all* outcome measures. Meditation techniques are inexpensive and easily learned, and require very few training sessions; all of these factors seem to make them ideal worksite interventions. Despite the fact that meditation was one of the earliest interventions to be used in work settings, and in light of the uniformly positive results of empirical studies, meditation techniques have not been popular in worksite studies. Their association with Eastern religions may have prevented their widespread acceptance in Western work settings.

Several trends in this research literature are noteworthy. First, only two of the studies published since 1988 used only muscle relaxation, biofeedback, or meditation as the main intervention. In prior years, these were the most common types of interventions[19-20] but studies using methods in the *other* category became much more common in the literature since 1990. Also, studies that combined two or more stress-management techniques as the main intervention were evenly spread across all years. The combination of muscle relaxation plus cognitive-behavioral skills training was the most common approach, followed by the combination of muscle relaxation plus cognitive-behavioral skills plus some other technique.

Another trend has to do with the effects of stress-management interventions on objective outcome measures. Although only three studies assessed biochemical changes after training (e.g., catecholamines, renin, angiotensin, and aldosterone), impressive results were reported in all three.[30,45,72] Similarly, all three studies that measured health-care costs reported impressive results after stress management.[29,40,44] In light of the equivocal effects of stress-management interventions on blood pressure and the lack of effects on job/organizational measures, these findings take on added significance and warrant special attention in future studies.

RECOMMENDATIONS

Stress-management interventions need to become more *comprehensive* and attend to the prevalent stressors in the work environment to produce significant effects on job/organizational outcomes.[92] Teaching workers stress-management skills is necessary and serves a useful purpose, but it deals with only part of the problem. The workplace is the source of powerful stressors that can be targeted for change. A few studies have documented the health-enhancing effects of implementing flexible work schedules,[93] increasing worker participation in decision-making,[94] and increasing worker autonomy.[95] Ideally, comprehensive interventions should include attention to *both* individual- and organization-level factors.

Stress-management studies need to include an assessment of stressors in the work environment in order to understand the stress-health dynamics. A job stress-assessment need not be a major undertaking; an initial assess-

ment could take the form of informal discussions with workers. Opening a channel of communication with employee serves to legitimize stress as a topic for discussion and is a good way to obtain valuable information about job stressors and employee reactions. Group discussions and questionnaire surveys can be used later to pinpoint common areas of stress and to measure the prevalence of the problem.[85]

Future stress-management studies could benefit by increasing the level of worker involvement in the design and evaluation of stress interventions. There is sufficient research attesting to the importance of worker involvement in organizational change efforts, and to the importance of the process (i.e., *how* the intervention is done) as well as the content of such interventions.[85] In most stress-management studies, consultants are positioned at the center of the decision-making process, where they make all the decisions regarding program design, assessment tools, interventions, and evaluation protocols. It is recommended that worker groups or joint labor-management committees be positioned at the center of the decision-making process, and stress-management experts relocated to the periphery. This "action research" approach has been used successfully in other studies of organizational change[95-97] and deserves more frequent use in stress-management research. Increasing worker participation and involvement in stress interventions will shift some of the emphasis to the process, without ignoring either the content or outcomes of training.[98] Reynolds and Shapiro[99] have made a convincing case for examining process variables as well as outcome variables in stress-management research.

Finally, stress-management studies need to be designed and evaluated within the context of a well-defined conceptual/theoretical model. A conceptual model is useful for defining the stressors, the short- and long-term consequences of stress, key intervening variables, and the nature of relationships among stressors, outcomes, and intervening variables. Once a model is specified, it serves to guide the choice of stressors to measure, the targeting of intervention strategies, and decisions on how to implement the intervention and evaluate its effectiveness. A model also is useful for generating testable hypotheses about expected effects of stress interventions on various process or outcome measures. A number of authors have proposed conceptual or theoretical models for stress management, but the models remain underused by stress-management researchers.[99-103] Evaluation of stress interventions should include both subjective and objective outcome measures that are assessed during short- and long-term follow-up periods. Objective measures are useful in cost-benefit calculations; these are rarely reported in research studies, but the few studies that have presented such calculations demonstrated impressive results.[29,40,44] (Evidence from a few studies not included in this review provide some indications that stress-management interventions can be cost-effective[104-107]). Additional guidance for the design and evaluation of worksite stress-management programs, and health promotion programs in general, can be found in a manual by O'Donnell.[108] Finally, ideas for addressing job stress through collaboration among employee assistance and human resource management departments can be found in Murphy.[109]

SO WHAT? Implications for Health Promotion Practitioners and Researchers

This review indicates that worksite stress-management training is effective in reducing negative health outcomes, and that the effects on any one type of health outcome depend on the specific stress-management technique used. Some techniques are more effective for improving psychologic health, while others produce significant changes on physiologic measures. On the basis of results from other studies in the field, we feel these conclusions are moderate to strong. On the basis of these findings, practitioners should decide up front on which type of health outcome they are trying to improve before selecting a stress-management technique. Researchers should design more comprehensive stress-management programs that attempt to change stressful aspects of the work environment as well as helping individual workers learn to manage stress through improved coping skills.

References

1. Shilling S, Brackbill RM. Occupational health and safety risks and potential health consequences perceived by US workers. Public Health Rep 1987;102:36-46.
2. Employee burnout: America's newest epidemic. Minneapolis, Minnesota: Northwestern National Life Insurance Company, 1991.
3. Warshaw LJ. Stress, anxiety and depression in the workplace: report of the New York Business Group on Health/Gallup Survey. New York: The New York Business Group on Health, 1989.
4. Kohler S, Kamp J. American workers under pressure. Technical report. St. Paul, Minnesota: St Paul Fire and Marine Insurance Company, 1992.
5. Emotional stress in the workplace: new legal rights in the eighties. New York: National Council on Compensation Insurance, 1985.
6. Fischbach TJ, Dacey EW, Sestito JP, Green JH. Occupational characteristics of disabled workers, 1975-1976. (DHHS NIOSH Publication No. 86-106). Washington, DC: US Government Printing Office, 1986.
7. Social Security Bulletin. Annual statistical supplement, 1989 (DHHS Publication No. 13-11700. Baltimore: US Government Printing Office, 1989.
8. Sauter SL, Murphy LR, Hurrell JJ Jr. A national strategy for the prevention of work-related psychological disorders. Am Psychol 1990;45:1146-58.
9. Murphy LR, Hurrell JJ, Sauter S, Keita G, editors. Job stress interventions. Washington, DC: American Psychological Association, 1996
10. Selye H. The general adaptation syndrome and diseases of adaptation. Journal of Clinical Endocrinology 1946;6:217-30.
11. Cannon WB. Bodily changes in pain, hunger, fear, and rage. Boston: CT Branford, 1929.
12. Lazarus RS. Psychological stress and the coping process. New York: McGraw-Hill, 1966.
13. Kahn RL, Wolfe DM, Quinn RP, Snoek JD, Rosenthal RA. Organizational stress: studies in role conflict and ambiguity. New York: Wiley, 1964.
14. Hurrell JJ Jr, Murphy LR. An overview of occupational stress and health. In: Rom WM, editor. Environmental and occupational medicine, 2nd ed. Boston: Little, Brown, 1992.
15. Cooper CL, Marshall J. Occupational sources of stress: A review of the literature relating to coronary heart disease and mental ill health. Journal of Occupational Psychology 1976;49: 11-28.
16. Quick JC, Quick JD. Organizational stress and preventive management. New York: McGraw-Hill, 1984.
17. Caplan RD, Cobb S, French JRP Jr, Harrison RV, Pinneau SR Jr. Job demands and worker health: main effects and occupational differences. (DHEW NIOSH Pub. No. 75-160). Washington, DC: US Government Printing Office, 1975.
18. Holt RR. Occupational stress. In: Goldberger L, Breznitz S, editors. Handbook of stress. New York. The Free Press, 1982.
19. McLeroy KR, Green LW, Mullen KD, Foshee V. Assessing the effects of health promotion in worksites: a review of the stress program evaluations. Health Educ Q 1984;11:379-401.

20. Murphy LR. Occupational stress management: a review and appraisal. Journal of Occupational Psychology 1984;57:1-15.
21. Frew DR. Transcendental meditation and productivity. Academy of Management Journal 1974;17:362-68.
22. Shoemaker JE, Tasto DL. The effects of muscle relaxation on blood pressure of essential hypertensives. Behav Res Ther 1975;13:29-43.
23. Peters RK, Benson H, Porter D. Daily relaxation response breaks in a working population. I. Effects on self-reported measures of health, performance, and well-being. Am J Public Health 1977;67:946-53.
24. Peters RK, Benson H, Peters JM. Daily relaxation response breaks in a working population. II. Effects on blood pressure. Am J Public Health 1977;67:954-9.
25. Sarason IG, Johnson JH, Berberich JP, Siegal JM. Helping police officers to cope with stress: a cognitive-behavioral approach. Journal of Community Psychology 1979;6:593-603.
26. Carrington P, Collings GH, Benson H, et al. The use of meditation-relaxation techniques for the management of stress in a working population. J Occup Environ Med 1980;22:221-31.
27. Gray-Toft P. Effectiveness of a counseling support program for hospice nurses. Journal of Counseling Psychology 1980;27:346-54.
28. Guzicki JA, Coates TJ, Goodwin DL. Reductions in anxiety and improvements in teaching associated with cue-controlled relaxation. Journal of School Psychology 1980;18:17-24.
29. Manuso (in Schwartz G.). Stress management in occupational settings. Public Health Reports 1980;95:99-108.
30. Patel CH, Marmot MG, Terry DJ. Controlled trial of biofeedback-aided behavioral methods in reducing mild hypertension. BMJ 1981;282: 2005-8.
31. Forman SG. Stress-management training: Evaluation of effects of school psychological services. Journal of School Psychology 1981;19:233-41.
32. Drazen M, Nevid JS, Pace N, O'Brien RM. Worksite-based behavioral treatment of mild hypertension. J Occup Environ Med 1982;24: 511-14.
33. Forman SG. Stress management for teachers: a cognitive-behavioral program. Journal of School Psychology 1982;20:180-87.
34. Ganster DC, Mayes BT, Sime WE, Tharp GD. Managing occupational stress: a field experiment. J Appl Psychol 1982;67:533-42.
35. Seamonds BC. Stress factors and their effects on absenteeism in a corporate employee group. J Occup Environ Med 1982;24:393-7.
36. Steinmetz JI, Kaplan RM, Miller GL. Stress management: an assessment questionnaire for evaluating interventions and comparing groups. J Occup Environ Med 1982;24:923-31.
37. Alderman M, Techlenburg K. Effect of relaxation training on personal adjustment and perceptions of organizational climate. J Psychol 1983;115:185-91.
38. Bowers PA. The effects of a stress management program on the knowledge, attitudes, symptomatology, and behavior of workers employed by an urban electronics industrial plant: a demonstration project. Occupational Health Nursing 1983; March:13-17.
39. Friedman GH, Lehrer BE, Stevens JP. The effectiveness of self-directed and lecture/ discussion stress management approaches and the locus of control of teachers. American Educational Research Journal 1983;20:563-80.
40. Manuso J. The Equitable Life Assurance Society Program. Prev Med 1983;12:658-62.
41. Murphy LR. A comparison of relaxation methods for reducing stress in nursing personnel. Hum Factors 1983;25:431-40.
42. Seamonds BC. Extension of research into stress factors and their effect on illness absenteeism. J Occup Environ Med 1983;25:821-2.
43. von Baeyer C, Krause L. Effectiveness of stress management training for nurses working in a burn treatment unit. Int J Psychiatry Med 1983-84;13:113-26.
44. Charlesworth EA, Williams BJ, Baer PE. Stress management at the worksite for hypertension: compliance, cost-benefit, health care, and hypertension-related variables. Psychosom Med 1984;46:387-97.
45. McNulty S, Jeffrys D, Singer G, Singer L. Use of hormone analysis in the assessment of the efficacy of stress management training in police recruits. Journal of Police Science and Administration 1984;12:130-2.
46. Murphy LR. Stress management in highway maintenance workers. J Occup Environ Med 1984;26:436-42.
47. West DJ, Horan JJ, Games PA. Component analysis of occupational stress inoculation applied to registered nurses in an acute care hospital setting. Journal of Counseling Psychology 1984;31:209-18.
48. Sharp JJ, Forman SG. A comparison of two approaches to anxiety management for teachers. Behavior Therapy 1985;16:370-83.
49. Firth J, Shapiro DA. An evaluation of psychotherapy for job-related distress. Journal of Occupational Psychology 1986;59:111-9.
50. Higgins NC. Occupational stress and working women: the effectiveness of two stress reduction programs. Journal of Vocational Behavior 1986;29:66-78.
51. Murphy LR, Sorenson S. Employee behaviors before and after stress management training. Journal of Occupational Behavior 1988;9:173-82.
52. Tunnelcliffe MR, Leach DJ, Tunnelcliffe LP. Relative efficacy of using behavioral consultation as an approach to teacher stress management. Journal of School Psychology 1986;24:123-31.
53. Agras WS, Taylor CB, Kraemer HC, Southam MA, Schneider JA. Relaxation training for mild hypertension at the worksite: I. The poorly controlled hypertensive. Psychosom Med 1987;49:250-63.
54. Bruning NS, Frew DR. Effects of exercise, relaxation, and management skills training on physiological stress indicators: a field experiment. J Appl Psychol 1985;72:515-21.
55. Chesney MA, Black GW, Swan GE, Ward MM. Relaxation training for mild hypertension at the worksite: I. The untreated hypertensive. Psychosom Med 1985;49:250-63.
56. Larsson G. Routinization of mental training in organizations: effects on performance and well-being. J Appl Psychol 1987;2:88-96.
57. Sallis JF, Trevorrow TR, Johnson CC, Hovell MF, Kaplan RM. Worksite stress management: a comparison of programs. Psychology and Health 1987;1:237-55.
58. Butcher P, Davis H. A personal effectiveness and stress management course for community health workers: a pilot study. Patient Education and Counseling 1988;12:13-27.
59. Keyes JB, Dean SF. Stress inoculation training for direct contact staff working with mentally retarded persons. Behavioral Residential Treatment 1988;3:315-23.
60. Long BC. Stress management for school personnel: Stress inoculation training and exercise. Psychology in the Schools 1988;25:314-24.
61. Bertoch MR, Nielsen EC, Curly JR, Borg WR. Reducing teacher stress. Journal of Experimental Education 1989;57:117-28.
62. Fiedler N, Vivona-Vaughn E, Gochfeld M. Evaluation of a work site relaxation training program using ambulatory blood pressure monitoring. J Occup Environ Med 1989;31:595-602.
63. Vaughn M, Cheatwood S, Sirles AT, Brown KC. The effect of progressive muscle relaxation on stress among clerical workers. American Association of Occupational Health Nursing 1989;37:302-6.
64. Barkum M, Shapiro DA. Brief psychotherapy interventions for job-related distress: a pilot study of prescriptive and exploratory therapy. Counselling Psychology Quarterly 1990;2:133-47.
65. Cecil MA, Forman SG. Effects of stress inoculation training and coworker support groups on teacher's stress. Journal of School Psychology 1990;28:105-18.
66. Goodspeed RB, DeLucia AG. Stress reduction at the worksite: an evaluation of two methods. Am J Health Promot 1990;4:333-7.
67. Larsson G, Setterlind S, Starrin B. Routinization of stress control programmes in organizations: a study of Swedish teachers. Health Promotion International 1990;5:269-78.
68. Stachnik T, Brown B, Hinds W, et al. Goal setting, social support, and financial incentives in stress management programs: a pilot study of their impact on adherence. Am J Health Promot 1990;5:24-9.
69. Kunkler J, Whittick J. Stress-management groups for nurses: practical problems and possible solutions. Journal of Advanced Nursing 1991;16:172-6.
70. McCue J D, Sachs. A stress management workshop improves residents' coping skills. Arch Intern Med 1991;151:2273-7.
71. Firth-Cozens S. Occupational stress, clinical treatment and changes in job perceptions. Journal of Occupational and Organizational Psychology 1992;65:81-8.
72. Francis ME, Pennebacker JW. Putting stress into words: the impact of writing on physiological, absentee, and self-reported emotional well-being measures. Am J Health Promot 1992;6:280-7.
73. Gronningsaeter H, Hytten K, Skauli G, Christensen CC, Ursin H. Improved health and coping by physical exercise or cognitive behavioral stress management-training in a work-environment. Psychology and Health 1992;7:147-63.
74. Pruitt RH. Effectiveness and cost efficiency of interventions in health promotion. Journal of Advanced Nursing 1992;17:926-32.
75. Alexander CN, Swanson GC, Rainforth MV, Carlisle TW, Todd CC, Oates RM. Effects of the transcendental-meditation program on stress reduction, health, and employee development—a prospective-study in two occupational settings. Anxiety, Stress and Coping: An International Journal 1993;6:245-62.
76. Reynolds S, Taylor E, Shapiro DA. Session impact in stress management training. Journal of Occupational and Organizational Psychology 1993;66:99-113.
77. Reynolds S, Taylor E, Shapiro DA. Session impact and outcome in stress management-training. Journal of Community and Applied Social Psychology 1993;3:325-37.
78. Robinson RC, Mitchell JT. Evaluation of psychological debriefings. Journal of Traumatic Stress 1993;6:367-82.
79. Toivanen H, Helin P, Hanninen O. Impact of regular relaxation training and psychosocial working factors on neck-shoulder tension and absenteeism in hospital cleaners. J Occup Environ Med 1993;35:1123-30.
80. Toivanen H, Lansimies E, Jokela V, Hanninen O. Impact of regular relaxation training on the cardiac autonomous nervous system of hospital cleaners and bank employees. Scandinavian Journal of Work Environment Health 1993;19:319-25.
81. Tsai S, Crockett MS. Effects of relaxation training, combining imagery, and meditation on the stress level of Chinese nurses working in modern hospitals in Taiwan. Issues in Mental Health Nursing 1993;14:51-66.
82. Doctor RS, Curtis D, Isaacs G. Psychiatric

morbidity in policemen and the effect of brief psychotherapeutic intervention—a pilot study. Stress Medicine 1994;10:151-7.
83. Freedy JR, Hobfoll SE. Stress inoculation for reduction of burnout: a conservation of resources approach. Anxiety, Stress and Coping: An International Journal 1994;6:311-25.
84. Vines SW. Relaxation with guided imagery: effects on employees' psychological distress and health seeking behaviors. American Association of Occupational Health Nursing Journal 1994;42:206-13.
85. Murphy LR. Occupational Stress Management: Current Status and Future Directions. In: Cooper CL, Rousseau DM, editors. Trends in organizational behavior, Vol 2. Chichester, England: John Wiley, 1995.
86. Jacobson E. Progressive relaxation. Chicago: University of Chicago Press, 1938.
87. Bernstein DA, Borkovec TD. Progressive relaxation training: a manual for the helping professions. Champaign, Illinois: Research Press, 1973.
88. Birk L Biofeedback: behavioral medicine. New York: Grune & Stratton, 1973.
89. Benson H. The relaxation response. New York: William Morrow, 1976.
90. Meichenbaum D. Cognitive-behavior modification. New York: Plenum Press, 1977.
91. Spielberger CD, Gorsuch RL, Lushene RE. Manual for the State-Trait Anxiety Inventory. Palo Alto, California: Consulting Psychologists Press, 1970.
92. Derogatis LR. SCL90, administration and scoring procedures manual-I for the revised version. Baltimore, Johns Hopkins University School of Medicine, 1977.
93. Murphy LR. Workplace interventions for stress reduction and prevention. In: Cooper CL, Payne R, editors. Causes, coping, and consequences of stress at work. Chichester, England: John Wiley 1988.
94. Pierce JL, Newstrom JW. The design of flexible work schedules and employee responses: relationships and processes. Journal of Occupational Behavior 1983;4:247-62.
95. Jackson SE. Participation in decision making as a strategy for reducing job-related strain. J Appl Psychol 1983;68:3-19.
96. Wall TD, Clegg CW. A longitudinal study of group work redesign. Journal of Occupational Behavior 1981;2:31-49.
97. Murphy LR, Hurrell JJ. Stress management in the process of organizational stress reduction. Journal of Managerial Psychology 1987;2:18-23.
98. Murphy LR. Managing job stress: an employee assistance/human resource management partnership. Personnel Review 1995;24:41-50.
99. Reynolds S, Shapiro DA. Stress reduction in transition: conceptual problems in the design, implementation, and evaluation of worksite stress management interventions. Human Relations 1991;44:717-33.
100. Newman JD, Beehr T. Personal and organizational strategies for handling job stress: a review of research and opinion. Personnel Psychology 1979;32:1-43.
101. Ivancevich JM, Matteson MT, Freedman SM, Phillips JS. Worksite stress management interventions. Am Psychol 1990;45:252-61.
102. Stoner CR, Fry FL. Developing a corporate policy for managing stress. Personnel 1983; May/June:66-76.
103. Heaney CA, van Ryn M. Broadening the scope of worksite stress programs: a guiding framework. Am J Health Promot 1990; 4:413-20.
104. Latack JC, Havlovic SJ. Coping with job stress: a conceptual evaluation framework for coping measures. Journal of Organizational Behavior 1992;13:479-508.
105. Steffy BD, Jones JW, Murphy LR, Kunz L. A demonstration of stress abatement programs on reducing employees' accidents and their costs. Am J Health Promot 1987;1:25-32.
106. Jones JW, Barge BN, Steffy BD, Fay LM, Kuntz LK, Wuebker LJ. Stress and medical malpractice: organizational risk assessment and intervention. J Appl Psychol 1988;73:727-35.
107. Murphy LR, Schoenborn TF, editors. Stress management in work settings. New York: Praeger Publishers, 1989.
108. O'Donnell MP. Design of workplace health promotion programs. 4th Edition. Rochester Hills, Michigan: American Journal of Health Promotion, 1995.
109. Murphy LR. Managing job stress: an employee assistance/human resource management partnership. Personnel Review 1995;24:41-50.