A Systematic Review of the Job-stress Intervention Evaluation Literature, 1990–2005

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Ninety reports of systematic evaluations of job-stress interventions were rated in terms of the degree of systems approach used. A high rating was defined as both organizationally and individually focused, versus moderate (organizational only), and low (individual only). Studies using high-rated approaches represent a growing proportion of the job-stress intervention evaluation literature. Individual-focused, low-rated approaches are effective at the individual level, favorably affecting individual-level outcomes, but tend not to have favorable impacts at the organizational level. Organizationally-focused high- and moderate-rated approaches are beneficial at both individual and organizational levels. Further measures are needed to foster the dissemination and implementation of systems approaches to examining interventions for job stress. *Key words*: job stress; work stress; occupational stress; intervention; systematic review.

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Interventions to alleviate job stress have multiplied rapidly over the last two decades, paralleling the increasing recognition and acceptance of the adverse impacts of job stress on individuals and organizations. This development has been reflected in the rapid growth of the job-stress intervention literature, which has been reviewed in various ways and from a range of perspectives over the last decade.[1–19]

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The goal of the present study was to identify models of international best practice through a comprehensive review of the job-stress intervention literature. In conducting the review, we expanded on and updated the most recent comprehensive review available at the outset of our project—the 2003 *Beacons of Excellence* review from the United Kingdom.[13] To facilitate the translation of our findings to policy and practice, we hypothesized that systems approaches are more effective than other approaches. Systems approaches—as elaborated below and represented in Chart 1—emphasize primary prevention (dealing with problems at their source). Additionally, they integrate primary with secondary and tertiary prevention, include meaningful participation of groups targeted by intervention, and are context-sensitive.[1] In devising a way to assess the degree of systems approach applied in each intervention study evaluated, we attempted to integrate the prevention frameworks of public health with the person/individual-directed versus organization/work-directed intervention frameworks more commonly applied in psychology and related disciplines, and with occupational health's hierarchy of controls.

In public health, interventions are commonly classified as primary, secondary, or tertiary.[20–23] In brief, *primary preventive interventions are proactive*, aiming—in the job-stress context—to prevent exposures to stressors and the occurrence of illnesses among healthy individuals. These address sources of stress in the workplace, or stressors, through alterations in physical or psychosocial work environments, or through organizational changes.[24] Primary preventive interventions can be driven by a range of influences, including organizations, workers or their unions, or mandatory or voluntary policy directives. Examples of primary preventive interventions include job redesign, changes in work pacing, enhancement of social support, and the formation of joint labor–management health and safety committees. Primary preventive interventions are also commonly referred to as "stress prevention."[13,25] Most primary preventive interventions are directed at the organization or the work environment, but they can also be directed at individuals—when addressing stressors rather than stress responses, as in conflict-management skills development in a hospital worker.

Secondary interventions are ameliorative, aiming to modify an individual's response to stressors. Secondary

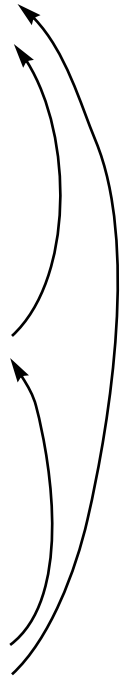
Intervention Level		Intervention Targets	Examples	Systems Integration
Definition & Description	**Effectiveness**			
1° — Primary • **Preventive, proactive** • Goal: reducing potential risk factors or altering the nature of the stressor before workers experience stress-related symptoms or disease	+++	• Stressors at their source; organisation of work; working conditions	• Job redesign, workload reduction, improved communication, conflict management skills development	
2° — Secondary • **Ameliorative** • Goal: To help equip workers with knowledge, skills, and resources to cope with stressful conditions	++	• Employee responses to stressors (perceived stress or strain)	• Cognitive behavioral therapy, coping classes, anger management	
3° — Tertiary • **Reactive** • Goal: To treat, compensate, and rehabilitate workers with enduring stress-related symptoms or disease	+	• Short-term and enduring adverse health effects of job	• WC system, Return-to-work programs, occupational therapy, medical intervention stress	

Chart 1. A Systems Approach to Job Stress

interventions target the individual with the underlying assumption that addressing individuals' responses to stressors should be done in addition to—or sometimes in preference to—removing or reducing stressors. Examples of secondary prevention interventions include stress-management classes to help employees to either modify or control their perceptions of stressful situations, such as the development of muscle relaxation or meditation skills.

Finally, *tertiary interventions are reactive*, aiming to minimize the effects of stress-related problems once they have occurred, through management or treatment of symptoms or disease. These include counseling (such as in the form of employee-assistance programs), as well as return-to-work and other rehabilitation programs. "Stress management" generally refers to secondary and tertiary interventions.[13,25] Ideally, problems identified in secondary and tertiary interventions should feed back to stressor-focused primary prevention (Chart 1).

In occupational health, the "hierarchy of controls" articulates general principles for the prevention and control of occupational exposure and disease. The hierarchy states in brief that the further upstream one is from an adverse health outcome, the greater the prevention effectiveness.[26,27] Accordingly, the physical work environment and other aspects of work organization have greater preventive potential as intervention targets than individual employees (for example, the use of personal protective equipment by employees). Hence, primary prevention is generally more effective than secondary, and secondary is generally more effective than tertiary (Chart 1). Importantly, however, these prevention approaches are not mutually exclusive and are optimally used in combination.[28] For job stress, primary prevention through improvements in the work environment is complemented by secondary prevention to address individual factors and detect any effects of work stress in a timely fashion such that tertiary rehabilitation or other intervention programs can be maximally effective.[9] At the organizational level, stress-related problems identified through secondary or tertiary-level programs should feed back to primary prevention efforts to reduce job stressors (Chart 1).

Finally, the processes through which interventions are implemented are also of central importance. A fundamental premise of public health—and the "new public health" in particular—is that the participation

TABLE 1 Electronic Search Results for Peer-reviewed Journal Articles

	ISI Search	Medline Search
Search term Group 1		
Occupational stress	982	338
Job stress	756	325
Work stress	549	323
Search term Group 2		
Intervention	91,479	77,474
Evaluation	>100,000	174,192
Stress management	845	680
Combining search term groups	51	116
Removal of reviews from Medline	51	91
Merge ISI and Medline	142	
Removal of duplicates	135	
Articles to review	135	

of those most affected in the formulation and implementation of responses is essential in addressing public health problems.[29] This principle is also specifically incorporated into the WHO's Ottawa charter on health promotion[30] as well as other workplace health-specific charters and declarations, such as the WHO's Health Workplace Guidelines[31] and the European Network for Workplace Health Promotion's Luxembourg Declaration.[32] Further, participation by those directly involved is likely to increase worker "control," "sense of fairness and justice," and "support," all of which are basic dimensions of job stress.[4] Thus, participation is a particularly important principle in conducting any job-stress intervention, and needs to be integrated into assessments of intervention quality.[25]

Participation also helps to optimize the fit of the intervention to the context at hand, and provides a means for integrating the participants' context expertise with the content expertise of the occupational safety and health or other professionals or researchers who usually direct the intervention. This is crucial because organizations usually require unique solutions to job-stress problems, even if the process of intervention may be based on generic principles and frameworks.[25] More traditional and complementary means of tailoring an intervention to context include needs assessment or risk assessment, through which information about the problem and appropriate intervention strategies are determined through systematic data collection.

In summary, systems approaches to evaluating job-stress interventions are consistent with the prevention frameworks of public health, psychology, and occupational health. Systems approaches to such evaluations are broadly comparable to other "best practice" models, which acknowledge the need to intervene at both organizational and individual levels.[3,4,6,8–10,12–14,25,33] Some use systems terminology.[1,4,34] Others describe similar approaches as comprehensive,[16] comprehensive stress prevention and management,[13] combined work-directed and worker-directed,[19] health promotion settings or determinants,[35–37] and 'healthy' or 'learning organizations.[38,39]

In preparing this review, we in effect tested the applicability of these various intervention frameworks integrated under the systems approach umbrella in the context of evaluating job-stress interventions. We present a systematic review of the job-stress intervention literature for the period 1990 through 2005, including 1) how we defined "systems approach" and assessed the degree to which it was applied in each intervention study reviewed, 2) the details of our comprehensive search and critical review, 3) our review findings, and 4) implications for policy and practice.

REVIEW METHODOLOGY

Search Strategy

Our search was designed to complement, extend, and update the most recent comprehensive review of job-stress intervention evaluations, the 2003 *Beacons of Excellence* from the United Kingdom.[13] The *Beacons of Excellence* study covered material published between 1990 and 2001. We revised and adapted the *Beacons of Excellence* search strategy specifically for the occupational health and medicine literature as well as for the psychological and social science literature in several ways. First, we used the search terms "occupational stress," "job stress," "work stress," "stress management," "intervention," and "evaluation." Second, we limited results to articles (excluding reviews) published in the English language from 1990 through 2005. Third, we searched Medline (to cover occupational health and medicine, and other public health sources) and ISI Web of Science (to cover psychological and social sciences). While these two databases often overlap, they have specific complementarities beyond covering different disciplinary bases (e.g., a prominent journal in the field, *Work & Stress*, is not covered by Medline but is covered by ISI).[40]

Medline and ISI Web of Science searches were conducted in April 2005. Thus, we have extended the coverage of the *Beacons of Excellence* review to include studies published from September 2001 to early 2005. The combination of "occupational stress," "job stress," and "work stress" was limited by the combination of "intervention," "evaluation," and "stress management." This generated 51 results in ISI and 116 results in Medline. The Medline search was then limited to exclude review articles, leaving 91 results. When combined with the ISI search, seven duplicates were found, leaving 135 articles for initial review (Table 1).

These articles were then reviewed manually to determine whether they were intervention studies. Qualifying intervention studies were then crossed with the 75

job-stress intervention studies identified in the *Beacons of Excellence* review, and complemented by other studies within the 1990–2005 timeframe identified by investigators, by their professional networks, and in other published job-stress intervention reviews.

Inclusion Criteria

This review focused on job-stress intervention studies that reported on some form of intervention evaluation. We defined job-stress intervention studies as those expressly aiming to alter the sources of, responses to, or effects of job stress.[1] In addition, much has been learned—in most cases about interventions that increase work stress—from natural experiments documenting the impacts of changes in job stressors or job stress over time (such as company downsizing or restructuring).[9,41] Natural experimental studies were not included in this review.

The full list of studies from electronic searches and other sources was subjected to the following qualifying criteria:

- Reported on a job-stress intervention (many etiologic studies that turned up in electronic searches had to be culled)
- Reported on intervention evaluation of some sort, including qualitative and action research studies, and those without control or comparison groups. (While we had hoped to also include developmental intervention studies[42,43] in order to capture intervention development insights gleaned from careful and systematic problem characterization, e.g., in arriving at justification for a systems approach, we found that we needed to limit the scope of the review for feasibility reasons.)
- Minimum sample size 30 individuals
- Interventions including employees or contractors independent of pre-existing susceptibilities, complaints, or illnesses (e.g., did not include Firth-Cozens et al.[44] because that study excluded patient populations, nor van der Klink et al.[11] because that study included interventions for employees reporting stress-related symptoms only)

Critical Review and Assessment

Each study was critically reviewed as described below by at least two reviewers, with a third reviewer where needed to resolve differences in assigned ratings, or to help distil findings.

Interventions were briefly summarized in tabular form (see Appendix*) in two ways: a "Systems Approach Rating," and descriptions of "Intervention Level(s)" and "Duration." Each study was assigned a high, moderate, or low rating depending on the degree to which a systems approach had been applied. "High" was assigned to those studies where primary prevention was the predominant approach, integrated with either secondary (e.g., based on risk assessment or other needs assessment, primary preventive interventions were directed at the organization and environment, and secondary interventions were included where risk assessment suggested they were likely to arise) or tertiary prevention (e.g., using workers' compensation experience to help direct and tailor primary preventive activities). In addition, as employee and other stakeholder participation and the conduct of needs or risk assessment are key elements of a systems approach, these are noted in the same column in addition to the H/M/L rating.

A "moderate" rating was assigned to those studies conducting primary prevention activities, but nothing else. Finally, a rating of "low" was assigned to studies that included little or no primary preventive interventions.

We also assessed and tabulated intervention targets.[22,23,45] "Intervention level(s)" were tabulated as addressing aspects of the physical work environment (E) (e.g., noise levels), the organization (O) (e.g., job redesign, workload reduction), the individual worker (I) (e.g., coping skills training, employee-assistance programs, conflict-management skills training), or the interface of the organization with individual workers (O/I) (e.g., mechanisms for employee participation, coworker support groups). These are related, but not equivalent to, primary/secondary/tertiary intervention levels, and thus provide complementary intervention description. For example, individual interventions can be primary (e.g., conflict-management skills training focusing on reduction of stressors) or secondary (e.g., coping skills training focusing on the individual's response to stressors). The duration of the intervention and timing of evaluation data collection were also noted where available.

Evaluation design and methods features were summarized in terms of comparison or control groups and measures used, the degree to which study design enabled attribution of observed effects to intervention, and principal findings. We rated the degree to which causal inference was supported by study design (i.e., the degree of confidence in attributing observed effects to the intervention and not other factors) using criteria adapted from Kompier and Cooper[6] and Murphy.[2] As applied in the recent *Beacons of Excellence* review,[13] we included only those studies that reported evaluation of some sort, thus requiring a three-star or higher rating:

★ Evidence that is descriptive, anecdotal, or authoritative

★★ Evidence obtained without intervention but that might include long-term or dramatic results

*Appendix is available in pdf format on the journal's web site at <http://www.ijoeh.com/>.

from general dissemination of information or medical agent into a population
★★★ Evidence obtained without a control group or randomization but with evaluation
★★★★ Evidence obtained from a properly conducted study with pre and post measures and a control group but without randomization
★★★★★ Evidence obtained from a properly conducted study with pre and post measures and a randomized control group.

Finally, principal findings were summarized in narrative form in the Appendix. This includes a shorthand summary of findings for each study as follows: findings favorable at the organizational level (O^+), such as a decrease in sickness absence, unfavorable at the organizational level (O^-), or no significant difference in outcome(s) assessed at the organizational level (O^{NS}). Similar shorthand was provided for individual-level ($I^{+/-/NS}$) and environmental-level ($E^{+/-/NS}$) outcomes assessed. These formed the basis of summaries presented in the Figures 1 and 3. Because very few studies assessed environmental-level outcomes, these were not summarized in aggregate. Finally, where multiple publications reported on the same study, these were reviewed as a single study for purposes of this review. In such cases, two or more citations are indicated in the single row summarizing the study in the Appendix tables.

RESULTS AND DISCUSSION

In total, 90 studies of single interventions met the inclusion criteria, were critically reviewed, and are summarized in Appendix Tables I and II. We also identified four studies (in seven publications[38,39,46–49]) reporting on interventions across multiple independent worksites or organizations. Because the various worksites included in each study applied varying degrees of systems approaches, these studies had to be assessed, reviewed, and tabulated separately (Appendix Table III), and were not included in the total of 90 (single) intervention studies.

There were various reasons for excluding articles or reports from the 135 articles identified in electronic searches, the *Beacons of Excellence* review, and other sources. Some of the studies were reported on in more than one publication, but each study was counted only once toward the total of 90 intervention studies. Many studies identified in the electronic searches were excluded due to recommending (but not including) intervention evaluation, not conducting systematic evaluation (less than three-star study design rating), focusing on patient or other restricted populations, and sample sizes less than 30.

Across the included studies as a whole, we observed a wide range of intervention targets (physical work environment, organization, organization/individual interface, and individual) and intervention durations (ranging from hours to years). Evaluation measures or outcomes also ranged widely, including stressors (e.g., job control, workload), short-term impacts (symptoms), and longer-term impacts (e.g., depression, sickness absence rates). Most of the intervention studies had been conducted in Europe and the United Kingdom, with smaller numbers from the United States and other countries. The included studies also covered a very wide range of designs, from qualitative case studies to quantitative randomized controlled trials. The studies reviewed included non–peer-reviewed reports, books, and book chapters as well as peer-reviewed journal articles.

Comparison of High- with Low-rated Systems Approaches

Thirty studies applied the high systems approach (30/90 = 33%); 17, moderate (19%), and 43, low (48%). In comparison with previous reviews, this indicates a growing use of high systems approaches. The *Beacons of Excellence* study rated only 9 of 75 studies (12%) as demonstrating best-practice "comprehensive stress prevention and management" (a designation similar to our "high"). Figure 1 shows that the proportion of low-systems-approach studies by five-year groupings declined over the 1990–2005 period, whereas the proportions of studies rated moderate and high increased.

> Conclusion 1: *Studies of interventions using high and moderate systems approaches represent a growing proportion of the job-stress intervention evaluation literature, possibly reflecting growing application of such approaches in practice internationally.*

Comparing studies that used high versus low systems approaches shows that the high studies tended to have longer intervention and evaluation follow-up times, usually on the order of months to years versus hours to months (Appendix Tables I–III). Evaluation outcome measures also tended to reflect intervention targets (Figures 2 and 3). That is, studies rated high more often targeted and measured organizational or environmental outcomes (29/30 = 97%), whereas those rated low more often targeted and evaluated outcomes at the individual level (41/43 = 95%) (Figure 2). Participation in intervention development or implementation, needs assessment before intervention, and integration of job-stress intervention with health promotion were more often features of high-rated studies in comparison with those rated low (Appendix Tables I–III).

Causal inference ratings. Taken as a whole, the causal inference ratings for the studies reviewed was fairly balanced across the three-, four-, and five-star rating levels (Table 2, bottom row). In studies rated as applying high systems approaches, the most common causal infer-

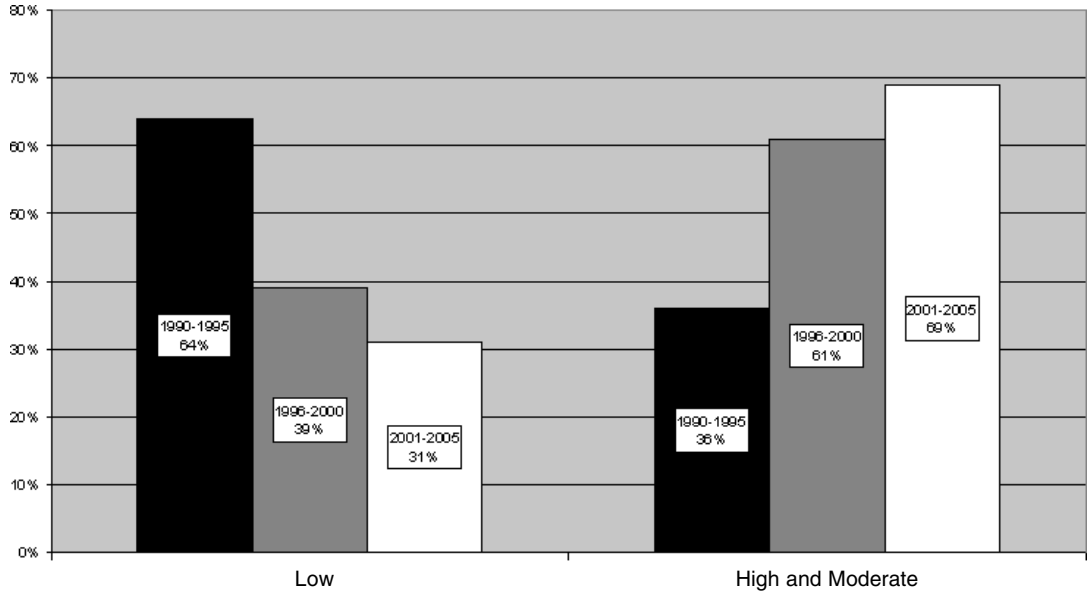


Figure 1—Job-stress intervention studies (n = 90): low-rated systems approach studies versus high and moderate-rated, by five-calendar year groupings.

ence rating was three stars (usually longitudinal with pre- and post-intervention measures), with controlled (non-random assignment to intervention versus control—four stars) studies intermediate in frequency, and experimental (random assignment to intervention versus control—five stars) studies the least common (Table 2, top row). This pattern was reversed in low-rated studies (Table 2), most likely reflecting the relative feasibility challenges of each (far more feasible to randomly assign individuals than organizations to treatment groups). It should be noted that there were some three-star–rated studies with very low causal inference (for examples, three studies that reported after-only evaluations without pre-intervention assessment[50–52]). In summary, these patterns indicate that the evidence base for high-rated systems approaches is both smaller and lower in terms of causal inference than that for low-rated studies (Table 2).

Relative effectiveness of various systems level approaches. We now turn to a comparison of evaluation findings between high- and low-rated studies. Figure 2 shows that low-rated studies usually assessed individual-level outcomes (95%), and usually reported favorable changes in one or more of these outcomes (35/41 = 85% of those including individual-level measures). The same pattern persists when the lowest-causal-inference (three-star) studies are removed, and only four- and five-star studies are included (Figure 3). The evidence base for low-rated studies is fairly strong, supported by a larger literature and stronger study designs (higher causal-inference ratings than for high-rated systems approaches). This general pattern has also been observed in previous reviews. Examples of individual-focused interventions include programs that promote progressive muscle relaxation, meditation, and cognitive behavioral skill training. While most individually-directed interventions were secondary in nature, focusing on the stress response, some also included primary-level interventions (e.g., a study in which an "emotion-focused" coping skills intervention [secondary] was compared with a "problem-focused" program that included attempts to modify stressors [primary][53]). Examples of individual-level outcomes utilized in these studies include somatic symptoms, physiologic changes (e.g., blood pressure, cholesterol levels), skills (e.g., coping ability), and psychological outcomes (e.g., general mental health, anxiety).

Conclusion 2: *Individual-focused, low-rated systems approaches are effective at the individual level, favorably affecting a range of individual-level outcomes.*

Low-rated studies tended not to evaluate organizational-level outcomes (13/43 = 30%), and tended not to have favorable impacts at that level (4/13 = 31% of those evaluating organizational-level measures) (Figure 2). As mentioned above, the same pattern persists when the lowest-causal-inference (three-star) studies are removed, and only four- and five-star studies are included (Figure 3). Organizational-level outcomes in our usage includes working conditions as well as those traditionally referred to as such (e.g., absenteeism, employee turnover, injury rates, and productivity). For example, in a randomized controlled low-rated study, Peters et al. observed some favorable changes in health behaviors, but no effects on absenteeism or a combined measure of job morale, job satisfaction, and productivity (Appendix Table II, page 41).[54] Further, in

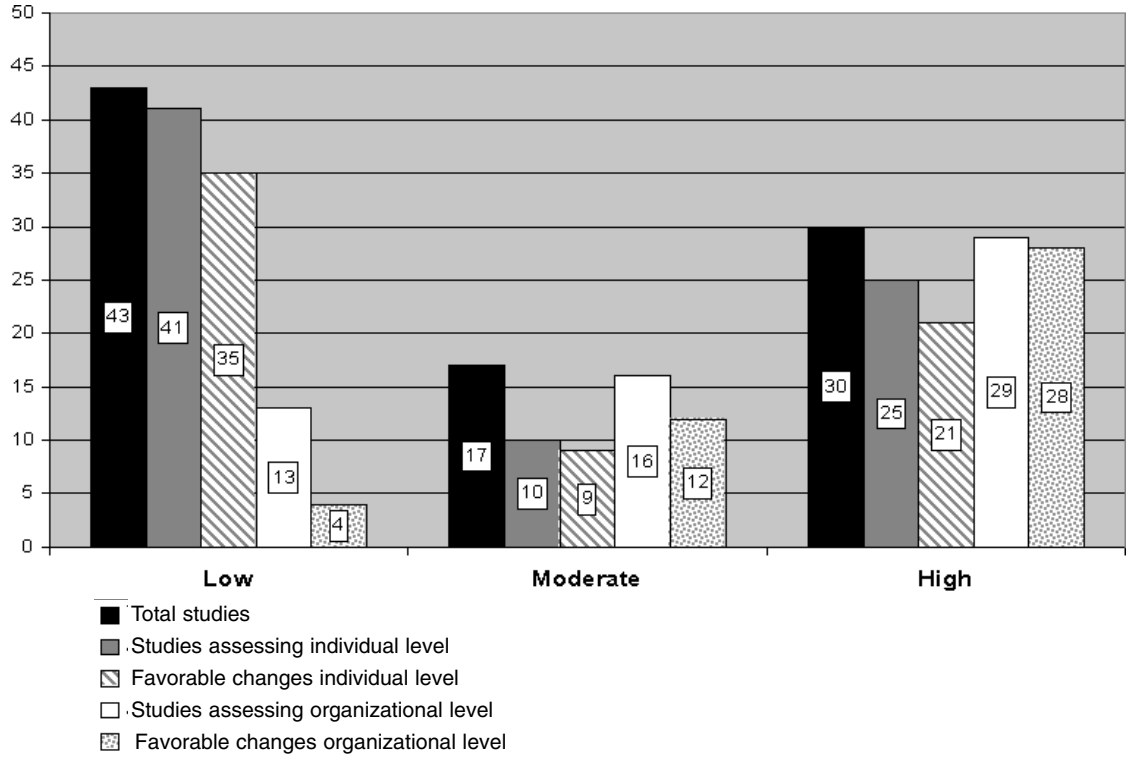


Figure 2—Total job-stress Intervention studies (n = 90): individual and organizational level outcomes, by systems rating level.

those studies where favorable individual-level impacts were observed and followed up after intervention, the effects could disappear over time. For example, Pelletier et al., in a randomized controlled study of a telephone-based stress-management intervention, found that intervention-associated decreases in somatization and anxiety that were evident at six months were no longer evident at one year follow-up.[55] This may, in part, be explained by return of favorably affected employees to unchanged (i.e., still stressful) work environments, resulting in the beneficial effects of individual intervention being eroded.[20,56] Further, in some cases, evidence of the benefits of individual approaches is mixed. For instance, in a critical review of individually-focused job-stress management interventions measuring blood pressure as an outcome (20 studies), Murphy found that a third of the participants failed to learn relaxation or other techniques, and that benefits were observed in both intervention and control groups: the average decrease among intervention groups was 7.8 mm Hg, versus 4.9 in controls.[2]

Conclusion 3: *Individual-focused, low-rated systems approach job-stress interventions tend not to have favorable impacts at the organizational level.*

This conclusion is supported by numerous other comprehensive job-stress intervention reviews.[2,4,5,9,12–14,17,19,56]

High-rated studies are less likely to assess individual-level outcomes than low-rated ones, but not markedly so (25/30 = 83% vs 41/43 = 95%, Figure 2). More importantly, high-rated studies are similar to those rated low with respect to favorable impacts at the individual level (21/25 = 84% versus 35/41 = 85% of those studies in which individual-level outcomes were measured, Figure 2). Moderate-rated studies also show a comparable likelihood of favorable impacts at the individual level (9/10 = 90%). Sharper differences emerge when comparing organizational-level evaluation and effectiveness. Most high-rated studies measured and found favorable impacts (28/29 = 97% of those where measured) at the organizational level. Similarly, moderate-rated studies almost always measured outcomes at the organizational level (16 of 17studies) and often found favorable impacts (12/16 = 75% of those where measured). In contrast, low-rated studies were much less likely to report favorable organizational-level outcomes in those cases where they were measured (4/13 = 31%). This indicates a sharp contrast between high/moderate versus low-rated studies in relation to organizational impacts. Again, the same patterns persist when the lowest-causal-inference (three-star) studies are removed, and only four- and five-star studies are included (Figure 3).

Conclusion 4: *Organizationally-focused high- and moderate-rated systems approach job-stress interventions have favorable impacts at both the individual and organizational levels.*

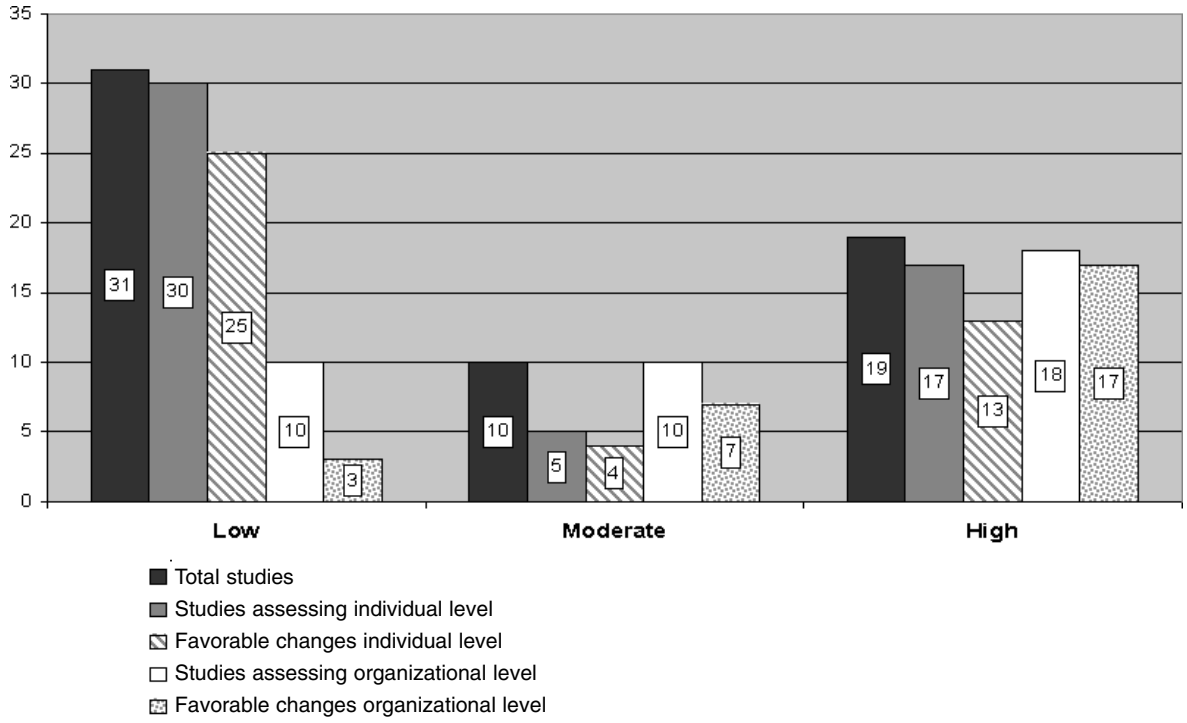


Figure 3—Job-stress intervention studies restricted to 4-star and 5-star designs (n = 60): individual and organizational level outcomes, by systems rating level.

The most common organizational outcome measured was absenteeism or sickness absence. Of the high-rated studies in which this was measured (n = 13, either as an organizational rate or self-reported), almost all reported decreases during or following intervention (11 of 13). For two studies, the findings were ambiguous; in one, absence rate was "not decreasing" in an uncontrolled study of nurses,[57] and in a study of U.K. government employees sickness absence was unchanged in the intervention group but greatly increased in the control group.[58] This pattern of favorable sickness-absence findings must be interpreted cautiously, however, as many of the relevant studies had low causal inference ratings or provided only minimal information about this outcome. However, the same finding persists after restricting to controlled and experimental studies (four- and five-star ratings), with eight of nine studies reporting favorable changes.[59–66] Given the high relevance of absenteeism to organizations and business leaders, this represents an important outcome for additional study.

The finding on absenteeism is further strengthened by the comparative studies reporting on job-stress intervention evaluations across multiple independent worksites (i.e., those not included in the 90 studies analyzed in aggregate in Figures 1–3). In a study comparing intervention evaluation results across 217 workplaces, Lindstrom found that sickness absence was favorably associated with more participatory and customer-service–oriented interventions (Appendix Table III, pages 49–51).[39] Similarly, in a comparative intervention study of 52 worksites, Nielsen et al. found that those workplaces that did the most to improve the psychosocial work environments (more primary intervention focused) achieved the highest reductions in absence rates.[48,67]

Economic evaluations. Of the six high-rated studies that reported economic evaluations of some sort, all six reported favorable results.[60,61,63–65,68] Four of these were controlled studies (four or five stars), but not all included appropriate statistical analysis of intervention versus controls (e.g., tests of significance of difference in change in intervention versus control groups). There were two studies with economic evaluations in the moderate-rated group, both reporting favorable economic outcomes.[69,70] None of the studies rated low reported economic evaluation. Economic evaluation was usually centered on costs of sickness absence, with some including productivity. Notably, positive organizational-level findings were paralleled by favorable changes at the individual level. These findings, however, must be interpreted cautiously due to moderate causal inference ratings. Three are detailed below.

- In an intervention with customer services and sales representatives, Munz et al. found a greater increase in sales revenue (23% vs 17% increase) and a greater decrease in absenteeism (24% vs 7%) in the intervention versus control groups; this was paralleled by significant improvements in perceived stress levels, depressive symptoms, and negative affectivity.[63]

TABLE 2 Causal Inference Ratings by Level of Systems Approach

	Three-star (No Comparison Groups)	Four-star (Quasi-experimental)	Five-star (Experimental)	Total
High	12	13	5	30
Moderate	7	6	4	17
Low	12	13	18	43
TOTAL	31	32	27	90

- In an integrated job-stress and physical activity intervention for Dutch manufacturing workers, Maes et al. found a significant drop in sickness absence in intervention (15.8% to 7.7%) versus control (14.3% to 9.5%) groups, which by the company's determination yielded a positive financial return on its investment *during* the project period.[60] This study also found significantly greater favorable changes in cardiovascular health risks (decrease), psychological job demands (decrease), job control (increase), and ergonomic risks (decrease) in the intervention group versus control. The known interaction between psychosocial and ergonomic exposures[71] may have played a role in the marked success of this intervention.
- In an integrated intervention study for Dutch hospital workers, Lourijsen et al. observed a significant difference in absenteeism percentage in an intervention hospital versus a control hospital after three years (4.0 vs 6.6).[65] Over four years, there was also a greater decline in the intervention (8.9 to 4.0) than in the control (7.1 to 5.4) hospitals, against a steady rate averaged across all Dutch hospitals (6.5 to 6.6) during the same time period. Estimated benefits (1.6 million Guilders) exceeded costs (1.2 million Guilders) at the intervention hospital two years into the intervention. Once again, this finding was paralleled by favorable changes at the individual level.

Intervention mechanisms. Some studies have integrated process and effectiveness evaluation, providing insights into pathways through which observed changes in outcomes might occur.[42] Some intervention-evaluation evidence supports hypothesized physiologic mechanisms from observational epidemiology studies, such as cardiovascular disease risk factors. Orth-Gomer et al. (in a study rated high) found improvements in lipid profiles in association with improvements in psychosocial work environment in a randomized controlled study (Appendix Table I, page 17).[72] Erikson et al. (high rated) reported a similar finding in a controlled study (Appendix Table I, page 6).[73] Finally, Rydstedt et al. (rated moderate) found significant improvements in blood pressure and heart rate to be correlated with reductions in job hassles for inner-city bus drivers (Appendix Table I, pages 25–26).[74] Thus, job-stress interventions affect cardiovascular disease risk factors, which epidemiologic study has shown to be on the causal pathway linking job stress to cardiovascular disease.[75]

Other studies illustrate how high- and moderate-rated systems approaches can favorably affect both individual and organizational-level outcomes. Bond and Bunce, in a randomized controlled study rated moderate, found that favorable effects on mental health, sickness absence, and performance were mediated by increased employee job control through work reorganization (Appendix Table I, page 22).[76] In a longitudinal comparative study of 81 Dutch workplaces, Taris et al. found that work-directed (primary-prevention–focused), but not other, interventions were linked to job-stress reduction (Appendix Table III, page 52–54.[49]

The importance of employee participation—central to high-rated systems approaches—is highlighted in other studies. In a comparative longitudinal study of 40 work groups, Eklof et al. found that high employee participation and integration of occupational health with traditional core organizational concerns was consistently associated with decreases in work demands, improvements in social support, and decreases in stress levels (Appendix Table III, pages 47–48).[38,46] In another longitudinal comparative study, Lindstrom found that a collaborative/participatory approach applied in the intervention correlated significantly with many changes in organizational climate, and most of all with an increase in continuous improvement practices (Appendix Table III, pages 49–51).[39] "Health Circles," as developed in Germany, provide an example of a systematic means of conducting participatory needs assessment and intervention development.[16,77,78]

Integrated OHS/HP interventions. There is a growing interest in intervention strategies that integrate occupational health and workplace health promotion.[79,80] We identified eight studies[54,60,64,65,68,81–83] in this review that integrated job-stress interventions with health promotion of some sort (e.g., physical activity,[60] smoking,[65] alcohol consumption[82]).

Five of these eight integrated studies had high systems approach ratings. Health behavioral outcomes were evaluated, however, in only two studies. In one, a significant increase in physical activity was reported,[60] and the other showed a decrease in smoking, but did not test this change for statistical significance. Three of the eight integrated studies had low ratings. One

reported a significant decrease in alcohol and cigarette use,[82] one reported "more health behavior changes" in intervention versus control groups,[54] and the third reported increases in physical fitness.[83] The two latter studies included organizational-level outcomes, and findings in each echoed our conclusion that individual approaches can be effective at the individual level (including health behaviors), but are less likely to be effective at the organizational level: Peters et al. found no impact of the intervention on any of the several organizational-level outcomes examined,[54] and Eriksen et al. found no effect on sick leave.[83] Integration with primary prevention in such interventions would both enable effectiveness at the organizational level and increase effectiveness at the individual level.

Though there are only a handful of integrated job-stress and health-promotion studies to date, there is great potential for improving worker health through integrated approaches, as reflected in the European Network for Workplace Health Promotion's 2002 Barcelona Declaration on Developing Good Workplace Health in Europe.[84] The Declaration links the increase in mental disorders in Europe to increasing psychosocial stressors and strain in the workplace, and declares that smoking and alcohol consumption are also work-related and "can only be tackled through health promoting workplaces." In the Australian context, the Tasmanian Workplace Safe agency has prepared excellent guidance material for employers and workers on "hidden hazards," including explicitly linking job stress with misuse of tobacco, alcohol, and other drugs.[85]

CONCLUSIONS

Studies of interventions using high- and moderate-rated systems approaches represent a growing proportion of the job-stress intervention evaluation literature, possibly reflecting growing application of such approaches in practice internationally. Individual-focused, low-rated systems approaches are effective at the individual level, favorably affecting a range of individual-level outcomes. Individual-focused, low-rated systems approach job-stress interventions tend not to have favorable impacts at the organizational level. Organizationally-focused high- and moderate-rated systems approach job-stress interventions have favorable impacts at both individual and organizational levels.

The observed growth in high- and moderate-rated studies in the literature evaluating job-stress interventions in comparison with previous reviews is a hopeful sign, suggesting that systems approaches are likewise growing in practice—at least internationally. But there likely remains a long way to go before high-rated systems approaches represent the norm in this area. Most previous reviews and authoritative declarations also indicate that individually-focused (low-rated) approaches continue to dominate.[6,13,17,25,36,86,87]

The available evidence indicates that high-rated systems approaches are the most effective in addressing the organizational and individual impacts of job stress. Organizationally-directed interventions appear to be more effective than individually-directed ones, despite the fact that low-rated studies of individually-directed interventions included some primary prevention. This finding is consistent with the hierarchy-of-controls principle that the further upstream the intervention, the more effective it will be at preventing both exposure and disease. Importantly, however, our findings also affirm individually-directed as an essential complement to organizationally-directed intervention, and the complementarity of primary, secondary, and tertiary intervention strategies.

Our findings are consistent with those from several other reviews that have applied similar lenses to the job-stress intervention literature, all of which acknowledge the need to address both the causes and the consequences of job stress.[3,4,6,8-10,12–14,25,33] In addition, addressing job stress using systems approaches is consistent with leading authoritative statements and declarations from policy and practice agencies.[32,84,87,88] The findings of this review provide further empirical support for these policy statements and declarations.

Our conclusions must also be qualified by the following limitations of this review. The conclusions are necessarily generalizations. The inclusion of non–peer-reviewed studies and those with low causal inference ratings (some three-star studies) limits the confidence with which observed effects can be attributed to interventions alone. However, this inclusiveness affords a more representative picture of prevalent practice, as internally-initiated interventions (i.e., not researcher- or evaluator-driven) tend to have less-developed evaluations and lower causal inference ratings, and are more often published in the grey literature. Restriction of summary analyses to four- and five-star studies (Figure 3) confirmed that inclusion of the lower-causal-inference (three-star) studies did not bias the conclusions. Further, our systems approach rating scheme was fairly crude, and was based only on information provided in publications. For example, studies were assessed as high if they included some type of organizational intervention as well as primary intervention, even if their focus was primarily individual (see, for example, van Diernedonck et al.[66]). The published literature tends to focus more on evaluation and often provides only limited descriptions of interventions. There is also likely to be a wide range of degrees of participation among those interventions noted in the tables as including participation. Our review was also limited to interventions including employees or contractors independent of pre-existing susceptibilities, complaints, or illnesses (i.e., excluded patient populations, only employees reporting stress-related symptoms). Other reviews have taken complementary approaches and reached differ-

ent conclusions. For example, a meta-analysis conducted by Van der Klink et al.[11] included only participants recruited from working populations because of imminent or already-manifested stress-related psychologic problems. From this meta-analysis, it was concluded that stress-management interventions are effective for such a target population, with cognitive–behavioral interventions being more effective than other types.[11]

We identified very few intervention studies that integrated tertiary-level intervention with primary and/or secondary (see Adkins[68] for an example of one that did). This finding suggests that this is also the case in prevalent practice. This situation represents a disconnect between tertiary-level and other intervention research and practice at the organizational level, and thus unrealized preventive potential. It should also be noted, however, that workers' compensation agencies sometimes target primary or secondary prevention efforts on sectors with high job-stress claims rates—which represents a policy-level integration of tertiary with primary and secondary intervention (see feedback loops in Chart 1). Most literature in this area focuses on (early) return-to-work programs for employees who have filed job-stress claims.[89] There are opportunities for building constructive links between tertiary and other intervention levels,[11,44,89,90] but also numerous pitfalls that are largely attributable to the inherent conflicts between public health and insurance concerns (i.e., characterizing the full extent of the problem and addressing it versus limiting liability).[89,91]

While this review was restricted to interventions expressly aiming to alter the sources of, responses to, or effects of job stress, we acknowledge that other types of studies also contribute valuable insights for job-stress interventions. These include developmental studies, natural experiments, and policy analyses.[42] Discussion of instructive job-stress–related examples of each of these other study types is provided elsewhere.[92]

IMPLICATIONS FOR RESEARCH, POLICY, AND PRACTICE

Further study is needed to develop the job-stress intervention evidence base to guide policy and practice. Studies that include organizational outcomes, such as absenteeism and economic measures, and use sophisticated causal-inference designs are particularly needed to strengthen the evidence base for high-rated systems approaches, and to encourage organizations to adapt systems approaches. Nevertheless, the available evidence clearly justifies the recommendation of high- over low- or even moderate-level systems approaches as most effective for addressing the impacts of job stress on both workers and the organizations employing them. This approach applies the precautionary principle in recognizing the need for further intervention research in this area, while simultaneously arguing that there is adequate evidence to justify concerted public health action to reduce job stress.[93] Though Europe and the United Kingdom are providing international leadership in addressing job stress using systems approaches, further policies, guidance materials, and other measures to foster the dissemination and implementation of systems approaches are needed in Australia and elsewhere in the OECD.

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