APPENDIX

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APPENDIX I: JOB STRESS INTERVENTION STUDIES 1990—APRIL 2005

These tables summarise job stress intervention studies that met our specified inclusion criteria. They are summarised into three tables, each ordered alphabetically by first author (first column). The first column also includes brief description of the study population and/or setting, and the number of subjects included in the evaluation. Appendix Table I includes all studies rated as having a HIGH systems approach to job stress intervention (second column), as defined in the Methods section. Appendix Table II presents all studies rated as having a MODERATE systems approach (ordered alphabetically by first author, starting on page 18), followed by those studies rated as having a LOW systems approach (ordered alphabetically starting again within same table, by first author on page 24). Finally, Appendix Table III summarises studies of multiple worksites where varying systems level interventions were implemented (ordered alphabetically by first author, starting on page 43)

Additional notes in Systems Approach column are: intervention included employee participation (PAR); needs assessment or risk assessment conducted to tailor intervention to context (NA/RA); job stress/occupational health & safety intervention integrated with health promotion (OHS/HP). Levels of intervention (third column) are noted as physical work environment (E), organisational (O), at the interface of organisation and individual (O/I), or individual (I). Intervention duration is also noted in the third column, with indicated units ranging from hours to years. Level of causal inference (level of confidence in attributing observed effects to intervention and not other causes) was rated as follows: *** = 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. Additional abbreviations used include: IG (intervention group); CG (control or comparison group); WC (Workers' Compensation); Indiv (Individual); Org (Organisational); GHQ (General Health Questionnaire); SF (Short-Form).

APPENDIX Table I: Job Stress Intervention Studies with "High" Systems Approach Ratings: 1990—April 2005

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
Adkins, 2000 [1]; US Air Force; n =16,193	HIGH PAR NA/RA OHS/HP	E, O, O/I, I 3 years (approx.)	No control group; Org-level: suicide rates, Workers' Compensation (WC) rates, WC costs, healthcare utilization rates and healthcare costs. Indiv-level: Measures of stress produced by personal health, threat of job loss, problems with supervisor, work relationships, conflicting responsibilities, deployment, workload, and being away from family; measures of absenteeism, work performance, and accidents; and measures of coping strategies.	3-*** QUAL	Org-level: After the first year, workers' compensation rates declined by 3.9% and health care utilization rates declined by 12%. Deaths resulting from behavioural problems, including suicides, declined by 41%. From 1995 to 1996 the suicide rate decreased 38% and an additional 25% from 1996 to 1997. However, no analyses were reported on the statistical significance of these improvements. Indiv-level (qualitative and quantitative data): Only baseline data reported ostensibly used to tailor intervention to specific contexts.
Aust, 1997 [2]; German bus drivers; n= 54	HIGH PAR	O, O/I 12 weeks	Non-intervention control group; Measure of need for control, evaluation of the program (participation, satisfaction, perceived benefits), and positive and negative mood.	4-****	Mean level of "need for control" (previously shown to predict heart disease) was significantly reduced in IG vs. CG at 12 weeks, and this effect persisted after 3 months. No significant impact on mood or symptoms. Suggestions for structural changes were discussed with superiors and,

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					after end of the group-based stress management program, they were dealt with by the official occupational health and safety committee of the company. This report restricted to assessment of immediate effects of the 12 week group program.
Barrios et al, 1997 [3]; Managers, engineers and factory workers; n= 48	HIGH	O/I 6 months	No control group. Personal Opinion Survey (for happiness, contentment, burnout, nervousness, tension, anxiety and anger), measures of job stress, heart rate variability, and blood pressure.	3-***	Evaluation of an "inner quality management program" showed increases in contentment, job satisfaction, and communication, and decreases in physical symptoms and blood pressure in hypertensive individuals.
Bunce and West, 1996 [4]; Health care workers n=202	HIGH PAR	O/I, I 3 months, 1 year	No-treatment control group; Measures of job satisfaction, motivation, health (GHQ), tension and innovation.	4-****	Differential impact of interventions: improvements in GHQ and satisfaction scores, and increases in innovation were experienced by PAR group.
Cahill, 1992 [5]; Social service employees in US; n=43.	HIGH PAR	O, O/I 6 months	No control group; Measures of skill discretion / development, decision latitude / authority, job satisfaction, autonomy and stress.	3-***	Improvement in decision latitude, skill development, job satisfaction and attitude to new technology. No changes to strain levels.
Cartwright, 2000 [6];	HIGH	E/O, O/I	Non-intervention division;	4-****	Indiv-level: Stress levels emanating

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
UK government department employees; n=343	NA/RA PAR	Interventions 1 year and ongoing Evaluation follow-up at 2 years	Measures of well-being, job satisfaction and attitude (OSI).	QUAL	from the organizational structure and climate were significantly reduced post-intervention in the intervention group compared to the non-intervention group (no change). No significant changes in physical and psychological health. Org-level: Significant post-intervention improvements in the intervention division in job satisfaction. Focus groups indicated improved organisational climate as a result of the intervention.
Eriksson et al, 1992 [7]; Public administration employees (Sweden) n=129	HIGH PAR	E/O, O/I, I Duration not specified	Four intervention work units and a no-treatment control work unit; Measures of social support, blood lipid profiles, general health and wellbeing	4-****	The education, discussion group, and action plan program was deemed to be more effective in groups that had a high degree of autonomy, high decision latitude and high initiative skills. In the intervention groups there was a significant increase in "good" cholesterol HDL (high-density lipoprotein), decrease in "bad" cholesterol LDL (low-density lipoprotein), and a sharp decrease in triglyceride levels. In the intervention groups, perceptions of more stimulating work, increased feedback from

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
					supervisors, and reduced workload were reported. In the control group, few psychosocial or physiological changes could be observed.
Feuerstein et al, 2004 [8]; Office workers with work-related upper extremity symptoms; n=70	HIGH	E, O/I, I One-time work station modification and stretching exercises and two 70-minute stress management education sessions. 3-month and 12-month follow-up evaluation	Ergonomics-only comparison group (provided with job stress resources) compared to a combined ergonomic and job stress intervention group; Measures of observed ergonomic risks and self-reported ergonomic risks, job stress (life stressors and social resources inventory), pain, symptoms, functional limitation, and general physical and mental health (SF12).	5-*****	While both groups experienced significant decreases in pain, symptoms, and functional limitation from baseline to three months with improvements continuing to 12 months post baseline, no significant differences between groups were observed for any outcome measures. Findings indicate that the additional two-session job stress management component did not significantly enhance the short- or long-term improvements brought about by the ergonomic intervention alone.
Griffin, 2000 [9]: Hospital employees n=540	HIGH PAR NA/RA	O, O/I, I Duration unclear. Pre-intervention survey and 2-year follow-up	No control group; Measures of organisational climate, employee morale and distress, turnover intention and noncertified sick leave.	3-***	A series of paired sample t-tests showed significant improvements, across the two years of the survey, to employee ratings of leadership, professional interaction/development, goal congruence, recognition, participation, workplace/individual morale, workload and workplace stress.

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
Griffiths et al, 2003 [10] UK Senior hospital nurses (H grade most senior, G grade middle seniority, F grade least senior) N = 80	HIGH PAR NA/RA	E, O, O/I 6 months	No comparison group; Baseline and follow-up survey: measures of general well-being ('worn-out' scores), overall job satisfaction, intention to leave, absence, musculo-skeletal pain, reported working conditions in terms of reported problems (e.g., lack of management support, lack of time for leave). Follow-up survey also included items on: awareness and involvement in intervention, perceived impact of the intervention, and whether the intervention had made things better for them.	3-*** QUAL	Overall, nurses reported being slightly less worn-out. There was a slight decrease in percent of G and H grade nurses intending to leave, but a slight increase in F grade nurses intending to leave. Nonetheless, both groups remained satisfied with their jobs and absence days per year remained low. Musculo-skeletal pain increased in both groups, but the reasons for this were not clear. Success rating explored amongst those involved in each intervention whether working conditions or well-being had improved in comparison with those not aware of or involved in the intervention. The increase in time allowed for administrative aspects of nurses' work, installation of computers, and appointment of housekeeping staff varied in success. The increase in administration time was successful if staffing was not an issue; however, where it was an issue its success was limited. The installation of computers if complete was viewed positively however if it was not fully completed or training had not been provided it was not recognised as a success. Study leave and training were evaluated as

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					effective. The intervention designed to increase communication was viewed positively.
Innstrand et al, 2004 [11]; Staff working with persons with intellectual disabilities; n=112	HIGH PAR	E, O/I 10 months	Non-intervention control group; Maslach Burnout Inventory (MBI), measures of job satisfaction, and work stress	4-****	The intervention group showed a significant reduction in stress and exhaustion, and a strong significant rise in job satisfaction after intervention.
Israel et al, 1989 [12] & 1992 [13], and Heaney et al, 1993 [14]; US manufacturing plant employees (86% hourly, 14% salaried) n=1100; n=176 (Heaney et al) [14]	HIGH PAR NA/RA	E, O, O/I 7 years (Israel et al) 5 years (Heaney et al)	No control groups —one participatory action research intervention in two independent branches of one company: one with cooperative labour-management relations, the other with adversarial; Israel et al: On-going qualitative evaluation and periodic employee surveys measuring support and well-being. Heaney et al: Measures of participation, participative climate, labour /management relations, social support and depressive symptoms (CES-D).	3-*** QUAL (Heaney et al: questionnaire survey, semi-structured interviews and field observations)	Israel et al: Although there were increases in co-worker support and trust between hourly and salaried staff, job security decreased due to a down-sizing and company split during the intervention. Consistent with this down-sizing event, there was also an increase negative feelings and sleeping problems, supervisor support, and some symptoms. Heaney et al: Employee participation in decision-making increased in both intervention conditions. Also found enhanced employee perceptions of the effectiveness of the process in both contexts, but employee well-being did not improve in either group. Labour management relations context

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	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
					influenced the impact of the stress project. The intervention enhanced employees' perceptions of the climate for participation only in the organization with more cooperative industrial relations. However, counter to hypothesized changes, increases in coworker support and decreases in depressive symptoms were associated with the intervention only in the organization with more adversarial industrial relations. This likely explained by adversarial setting having no previous opportunities for exchanging support with co-workers. Interpretations complicated by organization restructuring during study.
Kalimo, 1999 [15]: Forest Industry employees: n=c. 11,000	HIGH PAR NA/RA	E, O, O/I Ongoing intervention with consultation over 15 years (1984-1999) including, support, training, and feedback on changes in work conditions and work behavior. 2, 4 and 10 year devaluation data collections	No control or comparison group; Measured work-related and health-related factors: group support, commitment, and strain.	3-***	Work changes viewed positively but time pressures had increased. Overall level of stress remained low with the majority of staff assessing their psychological working capacity as good.

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	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
Kawakami 1997 [16]: Japanese blue – collar manufacturing employees: n=187.	HIGH PAR (supervisors only) RA/NA	E, O, O/I 1 year	Intervention group = 2 worksites (n=79) vs comparison group from 3 worksites (n=108) with complete data at 2 years follow-up Measures: depression symptom score, sickness absence, systolic and diastolic blood pressure, and work characteristics.	4-****	Statistically significant decreases in depression symptoms and days of sick leave in intervention vs control group (adjusted for gender age and baseline levels). No changes to blood pressure levels. Percent reporting work overload increased in intervention group versus control, due to an unanticipated intervention-independent workload increase at intervention sites that did not occur at comparison sites in same company.
Kvarnstrom, 1996 [17]: Swedish electrical manufacturing employees; n=c50.	HIGH NA/RA PAR	O, O/I 6 years and ongoing at time of publication; 1-year follow-up compared to data 2 years prior to intervention	No control groups: Measures of production, turnover, sickness absence and workplace injuries.	3-***	Significant reductions in turnover, absenteeism and injuries, and a major improvement in production.
Lavoie-Tremblay et al, 2005 [18] ; Health care workers in a long-term care unit;	HIGH PAR	E, O/I 6 months intensive, 1 year follow-up	No control group; Job Content Questionnaire, Effort Reward Imbalance Questionnaire, Psychiatric Symptom Index, and an indicator for recorded absenteeism.	3-***	There was a significant increase in reward and a significant decrease in Effort Reward Imbalance following the intervention. Absenteeism rates decreased from 8.26% to 1.86% over the study period, but in the rest of the

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n=60					institution remained the same. However, there was a significant decrease in social support from supervisors at post-test.
Logan et al 2005 [19]; Unit managers of a trucking company n=64	HIGH PAR	E, O/I 10-hour training session	Non-intervention control group; Measures of overall control, supervisory support, somatic complaints, depression (CES-D), anxiety, and job satisfaction (JDS).	5-***** QUAL	This was intended as a control-enhancing intervention for unit managers. The intervention increased perceptions of control after 4 months, but only for those managers with supportive supervisors. In conjunction with supervisory support, the intervention produced improvements in job satisfaction, but not general well-being outcomes. Process evaluation interviews indicated that the intervention was implemented as intended.
Lourijsen, et al, 1999 [20]; Employees of one Dutch hospital (n = 612) versus a control hospital (n = 382)	HIGH PAR NA/RA OHS/HP	E, O, O/I, I 3 years	Non-intervention control hospital; Org-level measures: absenteeism rates, intervention costs, and intervention benefits Indiv-level measures: Interviews with supervisors and measures of work organisation, employee health, health behaviours and absenteeism.	4-****	Org-level: Significant difference in absenteeism percentage in intervention versus control hospital after 3 years (4.0 versus 6.6). Greater decline over 4 years in intervention (8.9 to 4.0) than control (7.1 to 5.4) against steady rate averaged across all Dutch hospitals (6.5 to 6.6). Estimated benefits (1.6 million Guilders) exceeded costs (1.2 million Guilders) at the intervention hospital 2 years into the intervention. Indiv-level: Improved employee

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					opinions of how sick co-workers dealt with by management, quality of patient care, working conditions, and psychosocial work climate also reported. Little self-reported impact on health behaviours, however, these programs not yet implemented.
Maes et al, 1998 [21]; The Brabantia Project—Dutch manufacturing company employees; n = 264	HIGH PAR NA/RA OHS/HP	E, O, I 3 years	Non-intervention control group (n = 130) versus intervention (n = 134); Org-level measures: absenteeism rates Indiv-level measures: cardiovascular health risks, psychological job demands, job control, ergonomic risk factors.	4-****	Org-level: 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 in the project. Indiv-level: Manufacturing employees in intervention group versus control had significantly greater favourable changes in cardiovascular health risks (decrease), psychological job demands (decrease), job control (increase), and ergonomic risks (decrease).
Matrajt, 1992 [22]; Mexican manufacturing plant employees; n=130 managers and 3600 employees.	HIGH PAR NA/RA	O, O/I 17 weeks situation diagnosis and corrective phase, 12 months follow-up	No control groups; Measures of productivity, psychosomatic symptoms and internal relations.	3-***	Indiv-level: Progressive reduction in psychosomatic illness (17% for managers and 15% for assembly-line workers). Org-level: General work environment improved, with an increase in productivity and reduced absenteeism. Cost-benefit evaluation justified investment in the study through

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					increased productivity, savings in lost work hours and the costs of training replacement managers, and medical care and sickness benefits for assembly-line workers.
Melchior (1996) [23]; nurses; n=161	HIGH	E/O, O/I 1 year	No-treatment control group; Measures of Maslach burnout inventory, employee turnover	5-*****	There was no observed change in burnout inventory scores for the treatment or control group, but job turnover decreased significantly versus controls as a result of innovation in care delivery with emphasis on primary nursing, feedback/support, and communication skills training in order to reduce burnout.
Michie, 2004 [24]; Hospital cleaning (intervention) and catering (control) staff; n=221	HIGH PAR NA/RA	E, O, O/I Changes and new reporting systems introduced in one month Evaluation follow-up at 6 and 12 months	Cleaning staff intervention group (n=221) and catering staff control group (n=91); Org-level measure of monthly sickness absence rates	4-****	Significant, albeit small, reduction (2.3%) in the difference in sickness absence between intervention and control groups in the six months after intervention. The difference in sickness absence rates, however, was not maintained at 12 months.
Mikkelsen, 2000 [25]; Healthcare employees; n=135	HIGH PAR	O, O/I, I 1 week, 1 year	No treatment control group; Measures of work stress, health, demands/ control, skill discretion, decision authority, social support, role harmony, learning climate and	5-***** QUAL	Limited positive effect on work stress, job characteristics, learning climate and management style. Written reports from management, consultants and union representatives favourable regarding usefulness of intervention.

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
			leadership.		
Mikkelsen et al, 1999 [26] Postal workers N = 153	HIGH PAR	E, O 12 weeks intervention, 1 year evaluation follow-up	Compared two intervention groups (n = 91) to two control groups (n = 62); Cooper's Job Stress questionnaire Spielberger State-Trait Anxiety Inventory (STAI), Organizational Commitment Questionnaire (OCQ), Job satisfaction was measured by the Quinn and Shepard method, Job Content Questionnaire, Subjective health was measured by the Health Inventory; Social support, Learning climate and leadership were also measured.	5-*****	The goal of the intervention was to improve work environment and health, however this study was also affected by organizational restructuring and turbulence. Work conditions deteriorated during the observation period in the control groups. In one of the intervention groups, this negative trend was reduced by the intervention. Lack of positive results in the other intervention group may have been due to organizational restructuring and turbulence.
Munz, 2001 [27]; Customer service/sales representatives (USA) n=79	HIGH PAR	E, I 3 months 'comprehensive stress management program'	Four comparable work units in 4 different cities: two intervention (combined self-management training and stressor reduction process) versus two non-intervention control units. Org level measures: Productivity and absenteeism. Individual measures: Pre and post intervention questionnaires, measures of perceived stress, depression,	4-****	Org level: 24% decrease in absenteeism compared to 7% decrease in the control groups and 23% increase in productivity (measured by sales revenue) compared to 17% increase in the control group. Statistical significance of difference between intervention and controls not reported); Indiv level: Significant improvements in perceived stress levels, depression and positive/negative affectivity.

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
			positive/negative affect.		
Nijhuis et al, 1996 [28] Dutch construction employees; n=425	HIGH NA/RA OHS/HP	O, O/I, I Apparently ~1 year: Interventions (organisational structuring and training) started in autumn 1992, effects expected during 1993, Post intervention (2-year follow up) survey in 1994.	Two no-treatment control groups; Measures of absenteeism, health complaints, and employee attitudes to work	4-****	Baseline surveys were completed by all groups, however, authors do not specify how and if comparison groups were used in statistical analysis of pre and post data. Nevertheless, they report that: • Significantly fewer employee complaints with respect to aspects of job content and labour relations, ($p<.05$). • No significant reduction in employee complaints with respect to decision latitude, physical working conditions, stress-related fatigue, or health complaints; • Considerable reduction in absenteeism rates of managerial staff; • Sickness absence rates declined from 10% to 8% in the total population. Multiple regression analysis showed that 34% of this decline could be attributed to experienced differences in stressors (social relations, task information, and participation); • Economic evaluation found cost effectiveness through reduced absenteeism of managers, greater

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
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					capacity for spotting and solving problems, and improved efforts by workers.
Orth-Gomer et al, 1994 [29] Government office workers (Sweden) n=129	HIGH PAR	O, I 8 months	Non-intervention control group (n =35) versus intervention (n = 94); Physiological measures: apolipoprotein B/apolipoprotein AI ratio Psychosocial measures: job strain and social support.	5-*****	Intervention included education program, relaxation training, and worker committees which developed and carried out action plans to reduce work-related sources of stress. Found: • Significant decrease in apolipoprotein B/apolipoprotein AI ratio occurred in the intervention group, but not in the control group. • Stimulation from and autonomy over work significantly increased in the intervention group but remained the same in the control group
Poelmans, 1999 [30] Pharmaceutical company employees; n=3,261.	HIGH	E/O, O/I, I 1 year.	No control groups; Measures of stress experiences, psychosomatic complaints and work conditions.	3-*** QUAL	Significant reduction in sickness absenteeism. Intervention forced stress onto the company agenda with members being made aware of issues.
Sastry, 1992 [31]; Mining company in India: Managers (n = 204)	HIGH PAR NA/RA OHS/HP	O/I, I 3 day training program	No control group; Indiv-level: measures of qualitative job content (e.g., participation in decision-making, role ambiguity, interpersonal relations), stress-related health complaints, and health behaviours	3-***	Reported percentages of respondents indicating improvements at first feedback period (6 months), but no numbers (response rates) nor statistical analyses reported. Examples of findings: • 39% of the senior managers

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
Opeators and loaders (n = 404)					and 28% of the middle-level managers indicated improvements in qualitative content of the job • 47% of senior managers and 39% of middle-level managers indicated a reduction in their stress-related health complaints; • Shift schedules rearranged in response to need identified by operators and loaders; • 53 % of senior managers, 29% of middle-managers, 34% of operators, and 54% of loaders reported a "reduction in tobacco consumption".
Schaubroeck, 1993 [32]; Nonacademic university employees in a Midwest USA university; n=27 in intervention group n=25 in control group	HIGH PAR NA	E, O/I 2 year	Randomized controlled trial with control group waitlisted. Org level measures: Measures of absenteeism, role ambiguity / conflict and supervisor satisfaction. Individual measures: physical and mental well-being.	5-*****	Org-level: ambiguity and supervisor dissatisfaction were reduced through role clarification. Indiv-level: No significant effects The study took place during a period of organizational financial cutbacks with rumours of personnel cutbacks and job reclassification that were viewed negatively by the employees

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
Van Dierendock et al, 1998 [33]; Direct-care mental health professionals and staff N=149 at final	HIGH PAR	E/O, O/I, I 5 weekly group sessions of ½ day each Data collection pre-, 6 months post-, and 12 months post-intervention	External and internal control groups; Maslach burnout inventory, social support, turnover intention, absenteeism and equity	4-****	Burnout, absence, and deprived feelings (negative value in equity measure, indicating an inequitable relationship) significantly decreased relative to control groups. Turnover intention remained stable for intervention group, but increased for the internal control group.

[§]Additional Notes: intervention included employee participation (PAR); needs assessment or risk assessment conducted to tailor intervention to context (NA/RA); job stress/occupational health & safety intervention integrated with health promotion (OHS/HP).

[#]3- *** = evidence obtained without a control group or randomization but with evaluation; 4-**** = evidence obtained from a properly conducted study with pre and post measures and a control group but without randomization; 5-***** = evidence obtained from a properly conducted study with pre and post measures and a randomized control group

APPENDIX Table II: Job Stress Intervention Studies with "MODERATE" or "LOW" Systems Approach Ratings: 1990—April 2005

	Intervention		Evaluation		
Study; **First Author, Year** **Population and Sample Size**	**Systems Approach Rating (Low, Moderate, High)** **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
Bagnara et al, 1999 [34] Trainee nurses n=128	MODERATE	O/I, I 6 months of discussion groups (12-15 students) plus periodic meetings with supervisor	Non intervention control group Measures of psychological well-being (GHQ), anxiety, self -esteem, work expectations and work involvement.	5-*****	Psychological well-being (GHQ) improved significantly within the intervention group, but improvement in relation to control group not reported. Significantly more trainee nurses passed their exams in comparison to control group.
Blomkvist et al, 2005 [35]; Coronary critical care unit nursing staff (Sweden); n=36	MODERATE	E Sound absorbing ceilings installed and data collected at start and end of work shifts to calculate daily exposure effects during baseline "sound refecting period" of 20 weekdays, and intervention "sound absorbing" of 22 weekdays.	No control or comparison group; Measure of acoustics, pressure (stress, calmness, hastiness), strain (irritation, anger, tension), distress (anxiety, sadness, depression) and a condensed visual analogue version of the Swedish demand-control-support model.	3-***	Improved acoustics significantly reduced demands, strain, and pressure during the afternoons, while control/support and distress were not affected by the condition at all. Staff reported feeling more relaxed and less irritable during the intervention period. It was previously known that physical and psychosocial stressors can interact in producing enduring health effects. Notably, this study demonstrates that intervening on physical stressors can reduce psychosocial stress, thus exploiting the interaction in an intervention context.
Bond & Bunce, 2001 [36];	MODERATE	E/O, O/I	Matched randomized control group;	5-*****	Employee committees developed action plans to increase employee

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U.K. administrative employees; n=97	PAR RA/NA (Note: strong participatory methodology, but no indication of secondary/tertiary intervention)	Five 2-hour steering committee meetings over a 3 month period, plus various activities integrated into day to day work; 12 month evaluation follow-up	Measures of mental and physical ill-health, sickness absence (based on personnel records), performance, and job satisfaction. Used the Occupational Stress Indicator, and Job Content Questionnaire.		control in various areas. Significantly improved participant's mental health, sickness absence rates, and self-rated performance at 1-year follow-up Results also indicate that favourable effects mediated by increased employee job control through work re-organisation.
de Croon et al, 2004 [37]; Dutch lorry drivers; n=78	MODERATE	E 2 years	2 matched control groups; Measures of job demands and control, mental health (need for recovery after work) and job attitudes (organisational commitment) using the Dutch Questionnaire on the Experience and Assessment of Work (VBBA).	5-*****	Results showed that the application of on board computer (OBC)-systems negatively affected the drivers' job control and organisational commitment. However, OBC-systems did not influence the drivers' psychological job demands and need for recovery after work. Accordingly, it was concluded that the application of OBC-systems negatively affects the lorry driver's psychosocial work environment and job attitudes.
Elo, 1998 [38] Finnish carton production employees;	MODERATE NA/RA PAR	E/O 3-years	No control or comparison groups; Measures of variability of work, and mental and physical strenuousness (Occupational Stress Questionnaire).	3-*** QUAL	Indiv-level: Significant overall reduction in mental and physical strenuousness levels. Org-level: Significant increases in the

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n=118					variability of work in one department.
Landsbergis & Vivona-Vaughan, 1995 [39]; State government agency employees (US); n=77	MODERATE PAR	O, O/I 1 year as a pilot program	2 intervention departments and 2 waitlist control departments; Measures of communication, support, supervisor relations, job characteristics, organisational climate, job satisfaction and psychological/physical strain (i.e., depression and sleeping problems).	5-***** QUAL	Mixed impact on scores of the intervention in department 2 (relative to control 2), though univariate and multivariate analyses (adjusting for demographics and job characteristics) were borderline or non-significant. Negligible or negative impact in intervention department 1 (relative to control 1), though effects were non-significant. Intervention efforts were disrupted by a major organizational restructuring and hampered by lack of formal management and labour commitment to maintaining the intervention process.
Molleman, 1995 [40]; Healthcare employees (nurses); n=435	MODERATE	O 8 hours per week support by a staff nurse for 6 months 6, 12 and 18 months after start of intervention	Matched control groups; Measures of perceived control, autonomy and performance.	4-****	The new work design brought about a shift in control from head nurses to regular staff nurses, with the following higher in intervention versus control groups: • Level of control of nurses over primary care; • The extent to which nurses can make decisions autonomously • The necessity to consult nurses

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					before making decisions.
Parkes, 1995 [41]; Driving Test examiners; n=49.	MODERATE	O	Cross-over control; Measuring cognitive performance under variably demanding work.	5-*****	Significant decrease in both speed and accuracy while performing tasks with increasing workload.
Proctor et al, 1998 [42]; Nursing home care staff; N=84	MODERATE	O/I, I 6 month intervention	No-treatment control group; Used the occupational stress indicator and GHQ.	4 - ****	No significant differences were found between the intervention versus control group for this intervention in skill development in residential care provision.
Reynolds et al, 1997 [43]; City council employees; n=156	MODERATE NA/RA	O/I, I 1-year and 2-year evaluation follow-up	Non-intervention control group versus individual counseling group and organizational change group; Measures of job characteristics, psychological wellbeing, physical symptoms, work / life satisfaction and absenteeism.	4-****	No changes (psychological /physical well-being or absenteeism) due to organisational change intervention aimed at increasing participation and control of employees in day to day decisions. By contrast, favourable changes at individual level were observed for individual-focused comparison group (see Reynolds [1997], LOW, in Table II below).
Rydstedt et al, 1998 [44] and Evans, 1999 [45]; 	MODERATE	E, O Intervention on-	Field study: 10 intervention drivers and 31 matched controls;	3-***	Intervention on a difficult inner city bus line in Stockholm--designed to reduce traffic congestion, reduce passenger

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Swedish bus drivers n=21 questionnaire n=41 field study (observations of workload, psychophysiological reactions at work, and self-reported stress)		going over 2 years; Field study evaluation at one year; questionnaire study evaluation at 2.5 years.	Questionnaire for occupational stress and perceived workload; Field study for observer-rated job hassles, systolic blood pressure, heart rate at work, and perceived distress after work.		service, and reduce workload demands imposed on the drivers. Investigators hypothesised that initially elevated indices of job stress among drivers on the difficult intervention bus route would be reduced to levels equivalent to those in comparison group: results consistent with hypothesis in field study (n = 41): • Significant decline in systolic BP (-10.7 mm Hg) in the intervention group greater than the comparison group (-4.3 mm Hg); • Significant decline in heart rate (3.7 bpm) in the intervention group greater than the comparison group (0.5 bpm); • Significant decline in job hassles per hour (-4.5) in the intervention group greater than the comparison group (+0.6); • Changes in job hassles were significantly correlated to changes in systolic blood pressure, health rate, and perceived stress, but not diastolic blood pressure change This further supported by favourable decreases in perceived workload and distress in the smaller questionnaire study (n = 21)

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Smith et al, 1992 [46]; US meat processing employees; N =~ 125-150 (not specified)	MODERATE PAR NA/RA	E, O 1 year	No control group; Unstructured interviews and conversations including discussion of health status, psychosocial (e.g., job stress, job satisfaction), and other working conditions	3-*** QUAL	Overall, there seems to be some improvement in psychological indicators (nervous or irritable) for meat cutters and for meat wrappers, but not for meat processors. For psychosocial factors there appears to be an overall worsening effect for meat cutters and meat processors. Interviews showed that meat processors and meat wrappers had very positive feelings about the job enlargement program. They reported that their overall job satisfaction was greatly increased, even though this was not reflected in their responses in the survey. Meat cutters were generally happy with increased rotation away from cutting meat, but unhappy with the lower job content level of meat processing and wrapping. All groups felt that there was less job stress overall.
Terra, 1995 [47]; Dutch metal can manufacturing plant employees; n=430.	MODERATE PAR NA/RA (physical work environment) Note: Participation level very high,	E, O, O/I Initial intervention period not clearly specified- apparently 6 months, 5 years of follow up	No control group; Org level measures: Measures of productivity, sickness absence rates.	3-***	Org-level: • 50% reduction in sickness absence rate in comparison to significant increases in comparable plants (as reported by company OHS Service), saving 1 million Guilders per year; • 66% increase in productivity, from

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	with workers involved in job redesign.				0.26 to 0.43 million cans/worker/year. Indiv-level: not systematically assessed. Managers anecdotally reported that workers better qualified, informed, and motivated.
Theorell 2001 [48]; Insurance company employees; n=483.	MODERATE	O, O/I	No-treatment group; Measures of decision latitude, skill discretion, psychological demands, work climate, work pace, cholesterol, cortisol and gamma-GT	4-****	Results indicate the possibility of improving the work environment and decreasing employee arousal levels by providing adequate management training.
Wahlstedt & Edling, 1997 [49]; Swedish postal employees; n=100.	MODERATE	E/O, O/I, O Changes to ongoing systems and structures introduced in one month	No comparison groups; Measures of psychosocial factors' sleep disturbances, gastrointestinal complaints and sick leave.	3-***	At one-year follow up, significant increase in skill discretion and perceived authority was significantly correlated with lower levels for sleep difficulties and gastrointestinal complaints.
	Begin LOW				
Alexander, 1993 [50]; White collar employees in automotive industry; n=86	LOW OHS/HP	I	Matched controls; Measured skin conductance, general health, trait anxiety, work tension, sleep problems and job satisfaction.	4-****	Significant improvements in reducing skin conductance, trait anxiety and alcohol/cigarette use in comparison to the control group for regular attendees of MED program. Less effect for irregular attendees.

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Bond et al, 2000 [51]; Media organization employees n=90	LOW	I 9 hrs (over 3 months)	Randomized control group (waitlist, n = 30), 'emotion-focused' coping skills group (n = 30), and 'problem-focused' innovation promotion program group (n = 30); Measured GHQ, depression, motivation, job satisfaction and attitudes toward innovation and change.	5-*****	Improvements in mental health and work-related variables were found in both intervention groups (two types of stress management intervention). As hypothesized, changes in outcome variables in the coping skills group were mediated only by the acceptance of undesirable thoughts and feelings. In the 'problem-focused' Innovation Promotion Program, change was mediated only by attempts to modify stressors.
Carson et al, 1999 [52]; Mental health nurses; n=53	LOW	O/I Intervention duration unclear	Standard-care control group (provided with booklet on stress management) versus intervention group (individual feedback and support). Both groups received some form of feedback on questionnaire scores; Measures included the DeVillers Carson Leary Stress scale, GHQ, Maslach burnout inventory.	5-*****	Unexpectedly, greater stress reduction (in Stress Scale scores) was indicated in the control group (MD = -11.5) rather than the intervention group (MD = -3.0). These differences were statistically significant. In addition, this finding was supported by similar patterns in the related measures of GHQ and Maslach Burnout Inventory. Attrition of study subjects may have affected the results.
Cecil, 1990 [53]; School teachers; n=54	LOW	O/I, I	Co-worker support, stress inoculation training, or no-treatment control; Measuring teacher stress.	5-*****	Stress inoculation training was effective in reducing teachers' self-reported stress, while the co-worker support group was not

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Cigrang, 2000 [54]; Military trainees; n=178	LOW	I	"Usual care" control group: Measured graduation /discharge rates.	5-*****	No significant results reported after stress inoculation training.
Cooper, 1992 [55]]; English Postal employees; N=288	LOW NA/RA	I 2 years	Control group (non randomized) Org level measures: Measures of absenteeism Individual measures: mental health, self-esteem, organizational commitment and changes in health behaviors	4-****	Org-level: Significant improvement in absence rates. Indiv-level: Decline in anxiety levels and depression. Increase in self-esteem but no marked changes to satisfaction and commitment levels.
Delvaux et al, 2004 [56]; Oncology nurses; n=115	LOW	O/I 3 weeks (105 hours)	Non-intervention control group; Measures of nurse attitudes, communication skills, and occupational stress levels.	5-*****	Compared to controls, nurses who participated in a psychological training program (PTP) reported positive changes on their stress levels, communication skills, and attitudes.
Doctor, 1994 [57]; Police Officers; N=61	LOW	I	No-treatment control group; Measuring GHQ, stress symptoms and absenteeism.	5-*****	Response to stress symptoms questionnaire and counseling sessions implies that internal organisational issues where the main sources of dissatisfaction. No significant effects on absenteeism

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					and health.
Elliott, 1991 [58]; US pharmaceutical employees; n=56	LOW NA/RA	O/I, I Four 2-day workshops	No control group: Hassles Scale administered by mail one-month after workshops) and Myers Briggs Type Indicator.	3-*** QUAL	After-only: Positive subjective evaluations from participants of the relevance/usefulness of program. One month after, found lower Hassle Scale scores in intervention group (but with 42% response rate).
Eriksen et al, 2002 [59]; Postal service employees (Norway); n=860	LOW OSH/HP	O/I 12 weeks	Non-intervention control group (n =344), physical exercise only (n = 189), and integrated physical exercise and stress management training (n – 162); Subjective Health Complaint Inventory (SHC), self-reported sick leave, Cooper job stress questionnaire.	5-*****	The exercise-only group showed improved general health, physical fitness and muscle pain, and the integrated exercise and stress management group showed improved stress management, with the integrated group showing the strongest effects. Notably, however, there were no significant effects on subjective health complaints, sick leave, or job stress.
Ewers et al, 2002 [60]; Forensic mental health nurses; N = 33	LOW	O/I, I	Maslach Burnout inventory	5-*****	Significant improvements to the nurses' knowledge and attitudes towards clients.
Francis, 1992 [61];	LOW	I	Other activity group who wrote about	5-*****	Positive trends showing improvement

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University employees n=43			nontraumatic events; Measuring blood samples, absenteeism, positive/negative affect and emotional inhibition.		in blood values (except cholesterol) and absenteeism in intervention group. No substantial differences in wellbeing between the intervention and control groups.
Freedy, 1994 [62]; US nurses; n=87	LOW	I 5 weekly 75 minute sessions	Lagged intervention control group; Dual Resource Intervention (DRI) (targets both social support and mastery) treatment group and Single Resource Intervention (SRI) delayed comparison group (also served as no treatment control); Measures of social support, mastery of destiny, emotional exhaustion, depression (CES-D) and conservation of resources.	4-****	DRI group reported significant improvements in social support and mastery compared to the no treatment control, which persisted through a 5-week follow-up. DRI participants with low initial levels of social support or mastery reported significant reductions in psychological distress. SRI group reported a slight improvement in mastery compared to the no treatment control group.
Gardiner et al, 2004 [63]; General Practitioners; n=105	LOW	O/I 15 hours	Non-intervention control group; Measures of work-related distress and morale, quality of work-life, and general psychological distress (GHQ).	4-****	Following this cognitive behavioural stress management training program, GPs' quality of work life and morale improved while their work-related distress and general psychological distress decreased.
Goodspeed, 1990 [64];	LOW	I Five 90-minute	Time-Life Stress Management Program group (n=113) and Myers-	3-***	Baseline strain scores for the Time-Life group were significantly higher than for

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Various occupations; n=148		workshops for "Time-Life" and two 4-hour sessions for Myers-Briggs. Evaluation follow-up 6 to 8 months after baseline.	Briggs program (n=35); Used Stress Potential Survey and Strain Questionnaire (including physical, behavioural, and cognitive sub-scores).		Myers-Briggs group, further complicating interpretability of evaluation (in addition to imbalance in group sizes, and having no control). Significant reductions in follow-up strain measured in each of the three sub-scores as a result of both programs, although no between-group differences were identified at follow-up.
Greco, 1992 [65]; Canadian Government employees, n=229	LOW	O, O/I, I	No control groups, Measurement of job satisfaction, well-being, and quality of relationships.	3-***	Managers reported improvements to their management style, understanding of stressful situations and general well-being as a result of intervention. Employees reported improved ability to manage stress and improved team relationships.
Grossman, 1993 [66] Healthcare professionals n=41	LOW	O/I	No control groups: Measuring the effectiveness of support group.	3-***	Support groups experienced high drop out rates (perhaps individuals who needed the most help), however, participants of the program reported stress alleviation.
Heron, 1999 [67]; Pharmaceutical employees;	LOW	O/I, I 2-3 months.	No-treatment control group; Measuring GHQ, coping skills, stress management awareness and life	4-****	No-treatment group less aware of stress management and less adequate at coping.

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n=508.			events		
Hyman , 1993 [68]; Long-term care facility employees; N=51	LOW	O/I, I Three 3- hour sessions designed to address team building, communication skills, self-esteem, and stress management; Evaluation at session end	No control groups; Human Services Survey (Maslach and Jackson, 1981) (including emotional exhaustion, depersonalizations, and personal accomplishment and measures of work atmosphere.	3-*** QUAL	Using a retrospective pretest design (i.e., after-only), a statistically significant (n=42) improvement from "then" to "today" was found for: • Depersonalization • Emotional Exhaustion, and • Personal Accomplishment. Responses to an open-ended question about workshop effects corroborated the quantitative data. Open-ended interview question: participants reported an increase in self-esteem, improved communication, enhanced coping skills to deal with stress and an improvement in work atmosphere.
Iwi et al, 1998 [69] Local authority Housing Department employees n=193	LOW	I 3 months	Non-randomized control groups; General Health Questionnaire (GHQ) and Occupational Stress Indicator (OSI)	4-****	Workers accepting the offer of counseling were subject to greater levels of work stress, had poorer self-reported health and markedly lower levels of job satisfaction than those who did not. Questionnaire scores were not significantly different before and after counseling, giving no evidence of treatment effects on symptomatology. However, almost all

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					subjects rated counseling as having been extremely helpful. This study suggests that adverse effects on staff facing organizational change may be ameliorated by improved management practice.
Jenkins, 1991 [70]; Female public school teachers, Georgia, USA n=124	LOW	I Three hour seminar with or without individualised stress management plan	Compared seminar with step-by-step individualized stress management plan (intervention) versus global comparison (seminar without individualized stress management plan); Questionnaire items on types of stress experienced, sources of stress at work and home, effects of stress and burnout, variety and type of stress relief methods used, and degree of involvement.	3-***	Three weeks after the training, teachers provided with individualized step-by-step training reported a significantly greater increase in time spent managing stress versus the comparison group.
Johanning, 1996 [71]; US mass transit operators; Intervention n=98 Controls n=26	LOW OSH/HP	I One year, bi-weekly 7½-hour program sessions Evaluation after 1 year	Waitlist control group; Measures of job strain, musculoskeletal problems, CVD risk factors (Rose questionnaire), electrocardiograms, HDL cholesterol, total cholesterol, and systolic blood pressure. Psychological profile ("sense-of-life") based on in-depth interview.	4-**** QUAL	Indiv-level: Intervention group overall CVD risk reduced but not significantly compared to control group. Intervention group back problems were significantly reduced compared to controls. Org-level: No significant difference with respect to job strain.

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Kushnir, 1993 [72]; Safety officers; n=40.	LOW	I Five weekly meetings	No-treatment control group: Measures of cognitive weariness, somatic complaints, irrational beliefs and assertiveness.	4-****	Assertiveness, somatic complaints, and irrationality improved in the short term, and to a lesser extent 18 months later. Cognitive stress symptoms decreased in the long term. Assertiveness was improved in the short term.
Kushnir, 1998 [73]; Israeli occupational health practitioners; Treatment n=39 and controls n=25.	LOW	I 14 weekly 3-hour meetings	No-treatment control group; Measures of low frustration tolerance (a category of so-called "irrational beliefs") and professional psychosocial efficacy (Psychological Medical Inventory).	4-****	Mean scores of "irrational beliefs" were significantly reduced and the mean level of psychosocial efficacy increased in the treatment group. These are considered anti-stress resources, based on a model in which irrational/dysfunctional thinking is a cause of stress—but this model is not well validated.
Le Scanff et al, 2002 [74]; Male police officers n=150	LOW	O/I 6 months: initial four-day meeting, a two-day follow-up meeting one month later, and a final one-day meeting at six months).	No control group; A stress manifestations inventory (Adaptability Questionnaire, ADQ), group interviews/discussions.	3-*** QUAL	This essentially a qualitative process evaluation. Results indicated that the psychological training was very well received and led the police management to consider contributing factors and manifestations of stress in a more extensive way. However, not able to assess impacts on stress manifestations, as most participants kept for themselves their

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					ADQ scores. Subjective comments and feedback from the participants formed the basis of the program evaluation.
Lee et al, 1994 [75] Nurses; n=57	LOW	I Intervention duration unclear	Placebo intervention. Used the perceived stress scale.	5-*****	Findings indicated a greater decrease in stress for the treatment group as compared to the placebo group.
Lees et al, 1990 [76]; Nursing staff; n=53	LOW	O/I, I	No control groups; Measures of personality, assertiveness, coping and self-esteem.	3-***	Assertiveness positively correlated with emotional stability and self- esteem. Participative support groups nursing ensure the inclusion all staff regardless of personality.
Matthews et al, 2002 [77] Males aged 35-57 years, in various occupations: the Multiple Risk Factor Intervention Trial (MRFIT). n=12866	LOW	I 7 years (additional 9 years of follow up)	Randomized control group n=6438 given 'usual care'; Measured work and non-work stressors, cardiovascular disease mortality.	4-****	Increasing number of different work stressors and divorce during the trial were associated with total and cardiovascular mortality during the 9-year follow-up period (P <.01 for linear trend), with a relative risk of 1.26 (95% confidence interval, 1.07-1.48) for those reporting 3 or more different work stressors compared with those reporting none, and relative risk of 1.37 (95% confidence interval, 1.09-1.72) for those who divorced compared with

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					those who remained married for total mortality. Work and marital stressors increase risk for mortality in men.
McCue et al, 1991 [78]; Physicians; n=64	LOW	O/I, I ½ day workshop Evaluation 2 weeks pre-intervention and 6 weeks post.	Non-intervention comparison group (interested volunteers who could not be freed from clinical duties); Measuring burnout, stressors, stress symptoms and support skills.	4-**** 	This "modest, inexpensive stress management workshop" showed positive impacts of learning and practicing interpersonal skills that may increase the availability of social support; Intervention group reported a reduction in burnout levels and stress symptoms, and reported being more aware of work stressors and of support seeking opportunities.
Meier 2000 [79]; Social workers; n=52	LOW	O/I 10 weeks	Non-intervention control group; Occupational Stress Inventory	5-***** QUAL	No statistically significant changes in levels of occupational stress or psychological strain. The small sample size and relatively weak intervention of this feasibility study made it unlikely that any effects would be detected.
Michie, 1992 [80]; Hospital staff; n=163	LOW	I 6 months 1 year evaluation follow-up.	No control group; Measures of anxiousness, depression, sickness absence rates, perceived functioning and satisfaction.	3-***	Significant improvements to anxiety, depression, work satisfaction, life satisfaction, and perceived functioning at work observed 6 months post intervention.
Michie, 1996 [81]	LOW	I	No control group;	3-***	Highly significant reductions in anxiety

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	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
Hospital staff; n=92		6 months	Measures of anxiousness, depression, sickness absence rates, perceived functioning and satisfaction.		and depression and highly significant improvements in satisfaction with self.
Pelletier et al, 1999 [82]; Bank employees; n=136	LOW	I 6 months	Mail, mail plus telephone, and control group; Measures of job strain (JCQ), objective wellness (Stanford SMART health-risk appraisal), perceived wellness (Brief Symptom Inventory), self-efficacy, and feelings about personal control.	5-*****	No significant differences among groups were found in changes of any scales in the JCQ. At 1-year follow-up, the telephone group showed the largest improvement in mental health status rating, followed by the mail group, with a significant difference between the phone group and the control group. The telephone group showed increases in self-efficacy, perceived wellness, and feelings of personal control, with significant differences between the phone group and the control group. At 6-month assessment, the telephone group showed significant decreases in somatization and anxiety, but these differences were no longer evident at 1-year follow-up.
Peters, 1999 [83]; Maintenance workers in Hawaii, USA n=50.	LOW OHS/HP	I Ten weeks	Control group (wait listed); Indiv measures: Physical (e.g., blood pressure, cholesterol, overweight) and behavioural measures (exercise, smoking in health risk appraisal), self efficacy, health locus of control, state-	5-*****	Indiv level: Statistically significant Improvements in IG versus CG on: • health risk appraisal (more health behaviour changes), • number of people who lost weight in IG versus CG;

Study; First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
			trait personality, health attitudes and behaviour. Org level: rates of injury, absenteeism, overall measure of job morale, satisfaction, and productivity.		• in self-efficacy for stress management, exercise, and nutrition. There were no significant effects on emotional or psychological variables with the exception of "curiosity" Org level: No significant effects on rates of injury or absenteeism, or overall measure of job morale, satisfaction, and productivity.
Pruitt, 1992 [84]; Government employees; n=64.	LOW	I.	Waitlist control group; Measuring blood pressure, psychiatric symptoms, anxiety and life events.	5-*****	Significant reduction in reported stress-related physical symptoms. No major effect on anxiety and blood pressure.
Reynolds, 1997 [43]; City council employees; n=156.	LOW NA/RA	O/I, I Three 1-hour counselling appointments; 1-year and 2-year evaluation follow-up	Non-intervention control group, individual counseling group, and organizational change group; Measures of job characteristics, psychological wellbeing, physical symptoms, work / life satisfaction and absenteeism.	4-****	Individual counseling intervention improved the physical and psychological well-being of employees. There were no significant differences in absence from work after the intervention was introduced. Repeated measures MANOVA indicated that there were nonsignificant effects of comparison group and of time, but that there was a significant time X comparison group interaction

Study; First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
					[F(4,160)=2.45,p<.049], suggesting there were differential changes in the three comparison groups (see Reynolds [1997] in moderate table).
Reynolds, 1993 [85]; Female health service employees; n=92	LOW	I Six 2-hour stress management workshops at weekly intervals	No control group; Work / life satisfaction, general health questionnaire (GHQ), session evaluation and session impact.	3-***	Significant reductions in psychological distress (GHQ scores), but no changes in job or non-job satisfaction.
Robinson, 1993 [86] Emergency service, welfare and hospital employees; n=172	LOW	I 11 debriefings for welfare agency employees, 18 for emergency service personnel, and 2 for nurses 2 weeks post-intervention evaluation	No control group; Measuring impact of actual incident, stress symptoms and value of debriefings.	3-*** QUAL	Employees who reported symptoms of stress following critical incident also reported these to be reduced as a consequence of psychological debriefing (96% of emergency service workers, and 77% of welfare/hospital staff). Personal descriptions of how the debriefing was helpful were reported by 75% of emergency service personnel and 84%. The debriefing was valued more by staff who were more severely impacted.
Schaufeli, 1995 [87]; Community nurses;	LOW	O/I, I	No control groups; Measuring burnout, temperament	3-***	Treatment decreased and stabilised mental and physical symptoms, but

Study; First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
n=64.		1 month.	(reactivity) and performance.		had no major impact on performance. Low reactive nurses, who are able to draw upon coping resources and who in the main are resistant to stress gained more benefit from the program.
Sheppard, 1997 [88]; High security US government agency employees; n=44.	LOW	I 5 hours of instruction and 12 one-hour bi-weekly group meetings	Transcendental meditation (TM) treatment group and corporate stress management (CSM) education control group; Measure of blood pressure, state/trait anxiety inventory, depression and self-perception.	5-*****	Significant reduction in trait anxiety and depression values in treatment compared to control. Significant improvement in state/trait anxiety, depression and self-perception maintained by treatment group after 3 years without further training.
Smoot & Gonzales, 1995 [89]; State hospital employees; Intervention n=35 Control n=37	LOW	O/I, I 4 weekly 8-hour sessions Evaluation 6 months pre- and 6 months post-intervention	Waitlist control group; Measures of turnover, sick leave, annual leave, patients' rights complaints, assaults of staff, and cost-benefit analysis.	4-****	Org-level: Although no statistical testing performed, this "empathic skills training" intervention evaluation showed (in terms of % change over time): • Reduced staff turnover in IG (increased in CG) • Larger reduction in sick leave in the IG than in the CG • Reduced annual leave in IG (increased in CG) • Reduction in patients' rights complaints filed (with increase in CG) • Smaller reduction in assaults on

Study; First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
					staff in the IG than the CG Cost-benefit analysis revealed substantial savings for the trained unit and increased expenditures for the control unit.
Taylor, 1991 [90]; Nurses; n=102	LOW	I	Had treatment control group with random allocation. Measures of perceived stress scale	4-****	Significant difference between the control and treatment groups in stress reduction.
Teasdale, 2000 [91] Pharmaceutical company employees; n=452	LOW OHS/HP	O/I, I Workshops (duration not reported) ran over a 6-year period (subjects had attended at least one)	No-treatment control groups; Measures of well-being (GHQ), coping skills, life-events and stress awareness.	3-*** (after-only)	No significant differences reported between workshops attendees and non-attendees.
Toivanen, 1993a [92]; Hospital cleaners; n=50.	LOW	I 3 months, 6 months.	No-treatment of control group; Measures of absenteeism, EMG, depression and subjective work feelings.	5-*****	Intervention group reported significant reductions in muscle tension levels, sleeping problems and nervousness. Absenteeism levels reduced in control and intervention groups could be attributed to a “Hawthorne” effect or self reporting.
Toivanen, 1993b [93]; Hospital cleaners and bank	LOW	I 6 months	No-treatment control group; Measures of cardiovascular ANS function and stress.	5-*****	The relaxation method employed in this study normalised cardiac ANS functions when practiced regularly. Guided training proved to be more

Study; First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
employees N=98			Interviews discussing the employee's work situation were also held.		effective compared to individuals practicing on their own.
Tsai, 1993 [94]; Nurses (Taiwan); n=137.	LOW	I Intervention included 3 relaxation training sessions at weeks 1, 2, and 5 Evaluation at weeks 2 and 5.	Non-intervention control group; Measures of Nurses' Stress checklist (NSC) and Chinese General Health Questionniare (CGHQ).	5-*****	Intervention group reported a reduction in stress levels and symptoms after completing training course: • Mean scores for both NSC and CGHQ differed significantly between intervention and control groups at 5 week follow-up. • CGHQ scores also differed significantly at 2 week follow-up.
Vines, 1994 [95]; Unspecified workers from corporations; n=68.	LOW	I Intervention duration unclear. Evaluation follow-up at 9 and 20 weeks	Waitlist control group; Measures of depression, anxiety and personal lifestyle.	4-****	No significant difference between intervention and control groups for depression, anxiety, or health seeking behaviours.
Whatmore, 1999 [96]; Public sector	LOW	I Intervention period: 1 hour information sessions plus 2-hour	Waitlist and non-volunteer control groups versus 'personal stress awareness,' 'exercise,' and 'cognitive restructuring' intervention groups;	5-*****	At the 3-month post intervention stage, the exercise group reported improvements in physical and mental well-being and depression. However,

Study; First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
employees (UK); n=270.		workshops on 3 different topics followed by take-home assignments over ?3 months (unclear). Evaluation follow-up at 3 and 6 months	Measures of anxiety, depression, mental and physical well-being, organisational commitment, job satisfaction and self-reported sickness absence		most of the benefits gained from training were not sustained at six months. No "significant effects" (data not shown) on job satisfaction or organisational commitment. Sickness absence increased in all groups with the exception of the 'exercise' intervention group, which showed a decrease sickness absence rates 6-months post-intervention (no statistical analysis or comparison of difference with controls provided).
Wiholm 2000 [97]; Swedish Software developers working with computers n=106	LOW	I 1-1.5 hours of training over a three month period	Control group, one department selected for the intervention compared to another department without the intervention. Individual measures: Baseline and post-training questionnaires. Blood samples were taken at baseline, immediately post –training and 5 months post-training. Blood level testosterone, cortisol and prolactin were measured.	4-****	Indiv-level: Study assessed the effects of stress management training on skin symptoms. Stress management training was associated with a significant decrease in skin symptoms only during the actual training period. No beneficial effects measured 6 months post-training.

[§]Additional Notes: intervention included employee participation (PAR); needs assessment or risk assessment conducted to tailor intervention to context (NA/RA); job stress/occupational health & safety intervention integrated with health promotion (OHS/HP).

[#]3- *** = evidence obtained without a control group or randomization but with evaluation; 4-**** = evidence obtained from a properly conducted study with pre and post measures and a control group but without randomization; 5-***** = evidence obtained from a properly conducted study with pre and post measures and a randomized control group

APPENDIX Table III: Studies Reporting on Job Stress Intervention Evaluation Across Multiple Independent Organisations or Worksites (1990—April 2005)

	Intervention		Evaluation		
Study: **First Author, Year** **Population and Sample Size**	**Systems Approach Rating (Low, Moderate, High)** **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
Eklof et al, 2004a&b [98 99]; White-collar computer users: 40 groups from 11 private and public organizations (Sweden); n=342	Varying levels of Systems Approach—internal comparisons Included NA/RA and PAR to varying degrees.	E, O, O/I to varying degrees by organisation. Evaluation: baseline and 6-month follow-up employee surveys	Internal comparisons among the work groups, with data aggregated to work group level (n = 40); Measures of characteristics of change processes by degree of: • Employee participation (and empowerment) in efforts to improve work environment; • Integration of work environment issues with traditional core organisational issues; Were related to work environment and health improvement indicators: • Job control, psychological demands, social support, emotional stress, comfort during computer work, and physical complaints.	3-***	This was essentially a process evaluation study, assessing the degree to which the characteristics of the change process was related to intervention-associated improvements in ergonomic and psychosocial work environment. The change process characteristics of employee participation and integration of OHS with core organisation business were highly correlated, and may together constitute a positive organisational “learning strategy for change”. At follow-up and prospectively, high employee participation was consistently associated with: • lower demands (-) • higher social support (+), and • less stress (-) At follow-up and prospectively, high degree of integration was consistently associated with:

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
					• lower demands • higher social support (+), and • less stress (-). Neither participation nor integration was consistently associated with job control, quality of work environment modifications, comfort, or prevalence of musculoskeletal complaints. These findings support the importance of worker participation and integration of OHS into core organisational concerns to enable and facilitate work environment improvements.
Lindstrom 2000 [100]: Employees from 217 small and medium-sized enterprises in manufacturing, traffic, service, and office work sectors (Finland); n=4068 217 workplaces	Varying levels of Systems Approach—internal comparisons NA/RA: each enterprise and employee received feedback on baseline survey. PAR to varying	E, O, O/I, to varying degrees by organisation. Interventions up to 2 years in duration 1-2 years intervention and evaluation timeline	Internal comparisons between workplaces (n = 217); Surveys done on both employers and employees pre- and post-intervention. Measures of employee well-being (psychological strain), job satisfaction, sickness absence in previous 12 months. Organisational practices and climate assessed in terms of : • co-worker relations • supervisory support	3-***	For all worksites combined, over the intervention period there was a decrease in perceived physical work environment risk factors and workload, and an increase in job control. Time pressure, however, had increased over the intervention period. Based on employers' reporting, the statistically significant effects of interventions were most pronounced on organisational climate: • A collaborative/ participatory approach applied in the intervention correlated with many changes in

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
	degrees by workplace. Pooled analysis of a centrally coordinated intervention project, wherein participating worksites tailored intervention to their needs.		• continuous improvement practices • informing about changes • future insecurity of job • appreciation of one's work; Planned organizational interventions were also characterized by focus: • Customer service • Multi-skilling • Leadership • Collaboration between employees and managers (~employee participation) Organisational effectiveness was assessed in terms of (manager perceptions on 100-point scales): • Productivity • Profitability .		organisational climate, and most of all with an increase in continuous improvement practices (r=0.36, p<0.001). • Collaboration was also related to improved co-worker relations (p<0.05) and positive changes in job future insecurity (p<0.05), while leadership interventions decreased job insecurity less than other interventions(p<0.05) • Organisations with more intensive planned interventions in customer service (p<0.05) and collaboration (p<0.05) had a smaller increase in sickness absence compared with organisations having minor or no intervention; • Job satisfaction did not decrease (p<0.05), if the company carried out interventions in collaboration, "as compared to the others" Based on employees' reporting: • All intervention types were all related an increase in continuous improvement (p<0.001), in informing workers about changes (p<.05), and in appreciation of one's work (p<0.01)

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
					• Work capacity improved somewhat along with the multi-skilling of workers (r=0.06, p<.01) • Exhaustion symptoms decreased when the interventions were focused at colloboration (r=0.06, p<.0.001) Good profitability was related statistically significantly to all types of organisational development interventions. High production was related only to interventions dealing with multi-skilling of workers and the development of managerial practices. Results overall support a healthy work organisation model wherein the well-being of employees is central to company effectivess.
Nielsen et al, 2002a and 2002b [101 102]; Pharmaceutical, technical services, and nursing home employees at various worksites (Denmark); n=2068	Varying levels of Systems Approach—internal comparisons. Includes NA/RA and PAR to varying degrees	E, O, O/I—varying degrees. 3 years Post-intervention surveys 2 and 5 years after baseline	High-absence intervention work-sites (n = 22), high-absence control work-sites, and low-absence control work-sites (n = 30 control sites)—comparisons apparently among individual worksites (unclear). Job Content Questionnaire, SF-36, scales on meaning of work and predictability, absence from work,	4-****	At baseline, absence days per annum was significantly and positively associated all stress indicators, and was significantly and negatively associated with general health, vitality, and mental health. Improvements were achieved, but to very different degrees in different workplaces. Method of analysis and

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
	by worksite.		behavioural stress, somatic stress, emotional stress, and cognitive stress		results not detailed, but authors claim it is "statistically supported that": • the workplaces that did the most to improve the psychosocial work environment, achieved the highest drop in absence rate; • the workplaces in which the psychosocial work environment, due to different reasons, became worse have experienced the highest increase in the absence rate; • employees with reduced workability from workplaces where the psychosocial working environment was improved had a reduction in absence spells over the period; • employees with reduced workability from workplaces where the psychosocial work environment was not improved, or was poor initially, had a considerable increase in absence spells over the period.
Taris et al, 2003 [103]; Domiciliary care employees from 81 organizations (The Netherlands)	Varying levels of Systems Approach across organisations	O, O/I, I to varying degrees by organisation. 2 and ½ year follow-	All participating sites had intervention, but to varying degrees; unit of intervention and analysis = organisation; analysis by internal comparison relating intervention process to outcomes at individual and	3-***	Org-level: Overall means of job stress measures improved (job demands decreased, job control increased, social support increased, and emotional exhaustion decreased) over the intervention period (2 yrs).

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) **Additional Notes (PAR, NA/RA, OHS/HP)[§]**	**Intervention Level or Levels (E, O, I);** **Intervention Duration**	**Control or Comparison Groups;** **Evaluation Measures or outcomes**	**Study Design/Causal Inference Rating (3 stars to 5 stars)[#]** **Note if includes qualitative (QUAL)**	**Principal Findings**
N = 26,563	Includes NA/RA and PAR to varying degrees by organisation.	up evaluation	organisational levels. Measures of psychosocial working conditions: Emotional exhaustion (Maslach burnout inventory) as a measure of stress; job demands, job control, and social support; Type of intervention: work-directed (factual changes in work content and/or relations), person/work interface (to increase employee resistance to stressors), and person-directed (e.g., exercise, employee assistance programs, relaxation training)		Relating intervention process to outcome at the organisational level showed: • Organisations usually implemented a wide variety of intervention activities; • The greater the number of interventions activities, the greater the improvement in job stress measures at individual level; • Work-directed, but not other, interventions were linked to job stress reduction at the individual level; • A higher number of work-directed interventions was significantly linked to larger decreases in job demands at the organisational level. Similar work-directed intervention improvement patterns were observed for other job stress measures at the org level, but these did not achieve statistical significance. • Overall conclusion is that work-directed, but not other, interventions, are linked to job

Study: First Author, Year Population and Sample Size	Intervention		Evaluation		
	Systems Approach Rating (Low, Moderate, High) Additional Notes (PAR, NA/RA, OHS/HP)[§]	Intervention Level or Levels (E, O, I); Intervention Duration	Control or Comparison Groups; Evaluation Measures or outcomes	Study Design/Causal Inference Rating (3 stars to 5 stars)[#] Note if includes qualitative (QUAL)	Principal Findings
					stress reduction, although the effect sizes were small.

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