

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Matson-Koffman et al. (2005) continued							Johnson & Johnson: restructuring the environment, scales in restrooms, weight control and nutrition programs, offering healthier food in cafeteria and vending machines and information where food was sold, on diet behavior no data recorded, prevalence of overweight in the intervention group reduced by 1% after 1 year (statistically significant) 13 studies after 1990, in 5 studies showed positive effect of access to healthy food in cafeterias and/or vending machines, in 2 studies significant reduction in reported fat consumption, 4 studies showed sign. increase in food and vegetables consumption, one study found sign. increase in dietary fiber intake, 3 studies on access to healthier food + labeling observed no behavior change, 4 studies showed increased sale of healthy food for labeling and price reduction	to promote nutrition: point-of-purchase prompts to increase the sale of healthy food, labeling of healthy food, informational posters, offer of healthier food (low-fat, low-sugar, low-calorie) in cafeterias and vending machines
Seymour et al. (2004)	Medline, Chronic Disease Prevention Databases, Combined Health Information Database, Psycinfo, Web of Science (1970-2003)	38 studies, including 10 work-site intervention studies	adult populations	6 studies used good or very good design (no further information given)	nutrition environmental interventions in various settings (university, workplace, grocery stores, restaurants), either single intervention or part of a larger socio-ecologic program	outcomes not always suitable, valid instruments of measurement hardly used, criteria like change in sales in per cent with reference to diet behavior difficult to interpret lack of data on overall sales other covariates like e.g. spices which influence calorie content are considered infrequently, no study evaluated long-term effects of the interventions or cost issues need for true environmental interventions that involve incentives and access to healthier food instead of informational strategies because they address individual behavior only lack of attention to factors such as taste and enjoyment although this is one of the most important factors for the selection of food	8 studies conducted in workplace cafeterias, 2 studies used vending machines, 7 times sales figures as outcomes, 4 reported key figures of nutrition, duration of the interventions varied between 1 week and one year (short durations were more frequent) Information strategies: 3 studies, sales figures were significantly affected, labeling of the energy content of food resulted in decreased calories per tray, listing of low-fat entrées on a sign and placing a heart symbol next to the entrée resulted in increased sale of these, information on reasonable substitution of certain products (e.g. apple instead of apple cake) resulted in reduced calorie and sodium intake per tray, grams of fat decreased, but no statistically significant change, offer has already changed 8 months before) Changes in foods offered: 4 studies combined modified food offer with other strategies, 3 with information, 1 used information and price changes. 2 studies reported changes in the desired direction, 1 study found no sign. change, forth study also involved vending machines and did not find any change in the sales figures Incentives: 3 studies found, one used price change and information (price reduction resulted in increased sale of low-fat snacks, signs had no effect, neither alone nor in combination with price strategy, increase in overall sale, not only for healthy food), one used a raffle and a game (no difference found in energy content per tray when playing cards with nutrition recommendations were given to customers and/or tickets were given to persons who bought targeted products like salad, fruit or low-fat milk, increase in sale of products on raffle days was found), 1 study on cards with dietary information reported decrease in the sale of desserts and bread, increased sale of skim milk and fewer calories per day	most of the 10 studies at the workplace reported results in the desired direction from a general public health perspective: for being successful, interventions must go beyond simple labeling of products more research is required in the field of interventions that involve improved access, healthier food offer and incentives in general, worksites are suitable settings for environmental interventions

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Smeds-lund et al. (2004)	ABI/Inform, BRS, CHID, Dissertation Abstracts International Database, ERIC, Medline, Occupational Health and Safety Database, PsycInfo, Smoking and Health Database, Social Sciences Citation Index and Sociological Abstracts Database, references in reviews (1989-2000)	19 studies	working population, 6 worksites manufacturing/ construction, 2 utilities/transport/communication, 3 service/education/hospital, 6 "mixed", 1 "other", 1 had missing data	9 RCT, 10 controlled studies	Smoking cessation programs varied: 16 studies on self-help material, 13 studies on group cessation, 12 studies on "other type", 9 studies on incentives, 7 studies on steering committee, 4 studies on smoking bans, 2 studies on physician advice, 2 studies pharmacological treatment	despite the large number of evaluation studies (initial list included more than 100) studies often show methodological shortcomings, insufficient information on design, sample characteristics, industry sector and the like generalization of the results considered difficult since there is no standard of study documentation	<p>2 large RCT could not enter the meta-analyses since no abstinence rates were reported (study 1: implementation of local workplace smoking laws, smokers were more likely to report quitting in the prior 6 months, OR 1.5, 95% CI 1.1 – 1.7. study 2: 111 worksites, worksite was randomized unit, effects were evaluated by comparison of changes in intervention and control worksites, 2-year intervention related both to individuals and working environment, cross-sectional survey at baseline and follow-up changes in the desired direction observed, but not statistically significant)</p> <p>meta-analysis was carried out using a random effects model sample size varied between 56 and 2317 with a median of 426.5</p> <p>abstinence rates observed in follow-ups varied considerably both in intervention and control groups, large number of studies were carried out in worksites with high smoking prevalence and white, heavy smokers</p> <p>potentially relevant covariables such as previous quit attempts, cigarettes smoked per day and educational level reported only inconsistently</p> <p>OR and quit rates: up to 3 independent treatment conditions and up to 3 time points per study were extracted (42 effect sizes), in most cases the two simplest conditions were focused (treatment vs. no treatment) weighted ORs: 2.03 (95% CI 1.42 – 2.90) after 6 months, 1.56 (95% CI 1.17 – 2.07) after 12 months, 1.33 (95% CI 0.95 – 1.87) after more than 12 months overall quit rate: 16.7% in the intervention group vs. 8.5% in the control groups after 6 months, 20.8% vs. 12.2% after 12 months, 17.25 vs. 13.9% after more than 12 months RCT show stronger effect (OR 4.65) than non-randomized (1.74), greater precision of the estimates in the RCT, both types show homogeneity in the 6-month follow-up funnel plot shows strong evidence of publication bias effects do not seem to persist for more than 12 months, randomized studies were not homogeneous, set of non-randomized studies was heterogeneous, no evidence of publication bias was found here</p>	<p>meta-analysis confirmed results of a previous one effect might be underestimated because of conservative comparison strategy (but results can be interpreted easier) randomization effect: non-randomized studies showed stronger effects for all three follow-ups due to publication bias, effects are overestimated in randomized studies as well surprising, despite becoming more popular pharmacological treatment still is used rarely as a treatment condition (may be due the fact that most smoking-cessation drugs did not become over-the-counter medications until the late 1990s or that persons using these drugs were excluded from studies) authors wonder why program success did not increase over the decade of the 1990s, reasons could be that restrictions at the workplace became more widespread and smokers were more marginalized in the workplace and in general society, these factors possibly contribute to proportion of committed smokers not willing to quit and more likely to be nicotine dependent smoking cessation not only influenced by smoking cessation programs, but also determined by factors of organizational context</p>

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Moher et al. (2005)	Cochrane Tobacco Addiction Group Specialised Register (in October 2004), Medline (1966-October 2004), EMBASE (1985-2004) and PsycINFO (to October 2004)	61 studies found, assigned to one of the categories or to several	employees over 18 years of age who smoked	interventions aimed at individuals: only RCT included, interventions aimed at the working environment: also non-randomized controlled studies or time series studies	smoking cessation interventions aimed at the individual and interventions aimed at the workplace as a whole (for detailed information see reported effects)	analysis in some studies using cluster-randomized design ignored clustering, too few studies reported randomization procedures in sufficient detail 18 studies reported no appropriate randomization procedure or no randomization at all participation rates varied remarkably (between 11% and 88%)	<p><i>Interventions aimed at the individual</i></p> <p>Group interventions: 10 RCT with follow-ups after 6 to 24 months, in cases of more than one intervention arm control group (mostly self-help material or waiting list) was compared to next simplest treatment, also comparison of various treatments, some studies examined additional impact of incentives or monthly booster sessions</p> <p>support groups had additional impact in 2 of 3 large RCT, point prevalence after 12 months for group participants 26%, 16% for non-group participants, abstinence rates 11% and 3% (significant difference), second study: abstinence rate 31.2% after 12 months (sign. difference compared with other groups), 2 other studies showed trend of higher smoking cessation rates in group condition than in self-help (not sign.), small study tested a multi-component program with group intervention and self-help condition, showed no sign. difference (abstinence rates 19% versus 7%), in one study no long-term effect was found for relapse prevention and competition, abrupt versus gradual reduction: one third abstinent after 6 months in gradual condition, no participants abstinent in gradual condition, on account of small sample not significant, target behaviors in reducers found (sign. reductions), behavioral support and hypnosis had no effect, 3-month multi-component program showed 12% abstinence rate after 6 months vs. 9% in control group, relapse prevention more successful if supported by a psychologist (43.7% were abstinent after 12 months), than by ex-smokers (37.5%) and no formal support (35.5%), but no significant difference was found</p> <p>Intensive individual counseling: large RCT conducted in 160 civil service administration sections, 3 or 4 counseling sessions for participants depending on their cardiovascular risk, no intervention control group, after 2 years 21.4% of the smokers abstinent vs. 13.4% in control group, not sign. because participants lost to follow-up still were heavier smokers than attenders and controls, studies on physician counseling: participants more likely to stay abstinent than those with simple warning, point prevalence of abstinence rate 18.4% in intensive condition vs. 13.5% in warning condition, another study reported 12.9% vs. 3.1% cessation rates, 48.6% of the abstainers still were abstinent after 18 months, comprehensive program in 28 ambulance stations found no difference in abstinence rates in 6 or 12 months follow-up, when testing for effect of the counseling component a sign. effect was found (1% vs. 10%), study of male factory workers (screening of cardiovascular risk, written advice was given to workplace doctor and family, high-risk group received 6-monthly physician counseling, anti-smoking poster at the workplace, conferences on the hazards of smoking), smoking prevalence in high-risk group decreased by 18.7% after 2 years, 15 to 20 minute counseling by trained nurse,</p>	<p>workplace is an ideal setting for the offer of measures for smokers who want to quit</p> <p>strong evidence for effectiveness of group interventions, individual consultation and pharmacological treatment</p> <p>generally little participation in consultation programs, therefore in most cases only small absolute number of abstainers</p> <p>despite less strict study designs, the included papers suggest that bans on smoking and restrictions are well accepted, may lower the cigarette consumption at the workplace and considerably reduce the exposure to passive smoke, inconsistent evidence on the fact whether this can also reduce prevalence and overall consumption</p> <p>limited evidence for the fact that participation rate can be increased through incentive systems and competitive strategies, no influence on abstinence rate</p> <p>limited evidence for the fact that cessation programs that address individual behavior are more effective where they are extended with institutional approach, despite good theoretical foundation, to date no systematic evidence found for comprehensive programs for the effectiveness regarding smoking prevalence</p>

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Moher et al. (2005) continued							<p>if smokers participate in group cessation 4 follow-up calls for support quitting, after 12 months point prevalence cessation rate of 11.1% in intervention group vs. 1.8% in control group (but only 25 of 117 counseled smokers agreed to stop smoking)</p> <p>Self-help programs: computerized interventions: group with nicotine fading schedule showed abstinence rate twice as high as contest group after 6 months, not sign. (21.4% vs. 11.5%), no difference found between "American Lung Association Program" and internet-based program</p> <p>4 studies on video interventions found no effect on validated abstinence rates in groups receiving different videotapes, one study found a difference between video group and non-participants, testing self-help vs. group intervention: no statistically sign. effect found in abstinence rates between 3 types of self-help material</p> <p><u>Pharmacological treatment:</u> 12% abstinence after 1 year in group with nicotine gum vs. 2% in control group, with intention-to-treat analysis 7.8%, another study reported validated abstinence rate of 22% after 1 year compared with 2% in control group, complete rate (participants who had not smoked at all) was 6.3% vs. 2.4%, dose study on nicotine gum: after 3 months in 2mg dose group: 36.2% abstainers, 44% in 4mg dose group, after 1 year 22.3% and 32.2%, respectively (self report), effect not sign., placebo study: chewing gum and patch (18.1% vs. placebo chewing gum and patch (12.7%) vs. placebo chewing gum and placebo patch (13.3%) abstinence after 12 months, OR group 1 vs. 2 and 2 vs. 3 was not significant, study on counseling and patch: validated abstinence rate after 12 months: 20.2% vs. 8.7% in control group, OR 2.58</p> <p><i>Interventions aimed at the workplace as a whole</i> <u>Workplace smoking bans and control policies</u> in 8 studies reduction of tobacco consumption at the workplace (e.g. initially 16.9% smokers with more than 15 cigarettes per day, 7.5% after one month, 4.9% after 6 months), less consistent evidence that general tobacco consumption is influenced as well (8 studies report small effect, three found no change at all in general consumption), inconsistent evidence that smoker prevalence is influenced by bans (5 studies found no difference, 4 studies showed only small decrease), 2 studies found sign. differences (from 22% to 14% and from 29% to 24%, after 1 year, respectively), validated abstinence rate after 3 months in worksite with ban higher than in company without ban (9.2% vs. 1.4%, sign.), in hospitals cessation rates decreased by approx. 4% (7% in policy, 11% in control hospital), 2 studies found decreased smoke exposure, 3 studies improved air quality, 12 studies on acceptance of the bans: only one reported disapproving attitude by smokers (approx. 60%) still after 6 months, rest reports acceptance (but: large number of studies were conducted in medical facilities)</p>	

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
<p>Moher et al. (2005) continued</p>							<p>Social support: 2 studies found no difference between basic program and program plus additional support by a person chosen by the participants themselves, participants relapsed after 6 months regarding number of smoked cigarettes, second study found reduction of nicotine content in both conditions after 6 months, but number of cigarettes per day was statistically sign. higher than at immediate post-test, same pattern found for percentage of each cigarette smoked, although group rate in support condition was lower after 6 months than at baseline, same pattern for carbon monoxide level as well, but metabolites in saliva were higher concentrated than at baseline</p> <p>Environmental support: comprehensive program resulted in abstinence rate twice as high in environmental intervention worksite, training program for cessation group leaders plus manuals to carry out plant-wide tobacco control and health promotion activities failed to detect an effect, 12-months quit rates were 22% and 18% with environmental support, program involving 4 conditions showed slightly higher abstinence rates in groups with supporting components, differences were not sign.</p> <p>Incentives: cluster RCT found no difference between groups with vs. without monetary incentives, in another RCT: payments delayed relapse, but did not prevent it, other RCT detected no effect of monetary incentives, RCT with groups: higher participation rate in worksites with incentives, but abstinence rates were not influenced, cluster RCT (in 28 hospitals; see results on individual counseling) found no effect of individual or group incentives</p> <p>Comprehensive programs: program to reduce cardiovascular risks, consisting of employee steering committee and range of activities tailored to each worksite, no change found in smoking rates, nutrition or cholesterol levels, not even short-term effects compared to control group, second study with modified menu and added guidance for steering committee found no effect either, one study conducted in 4 companies combined individual and environmental interventions on dietary and smoking behavior, each site added an additional component for addressing an additional risk factor, no sign. difference in abstinence rates and smoker prevalence was found when compared with control group after 6 months</p> <p>RCT on 2-year intervention, aim: modification of dietary and smoking behavior, integrated health promotion through co-operation between employees and health protection through worker-management participation regarding workplace changes, education including smoking cessation, differences between blue-collar and white-collar workers were addressed, 6-month abstinence rate was higher in intervention group than in control group (15% vs. 9%, not sign.), study based on this trial tested similar program, no significant difference found, reduction in point prevalence after 6 months 4.1% vs. 1.6%,</p>	

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Moher et al. (2005) continued							<p>cohort analyses detected no sign. effect on overall abstinence rate (11.3% vs. 7.5%), study focusing on physical activity found no sign. difference between 7-day point prevalence cessation rates (25.6% vs. 21.8% in control group) or after 6 months (8% vs. 8.1%), study comparing a program consisting of self-help material, group courses, mass media campaign, smoking bans with minimum intervention found no effect on abstinence rate after 6 months, another multiple program including smoking cessation to control cardiovascular risk with individual counseling plus 16 annual group sessions, lectures, videotapes, discussions and outdoor activities, after 12 and 18 months smoking prevalence decreased from 65% to 31% vs. 65% to 63% in control group. study with 4 conditions (no non-intervention group), components (one additional intervention at each level): health risk appraisal, health newsletter, self-care books, behavioral workshops, social support team, after 2 years on all intervention levels but one a sign. reduction of smoking prevalence was observed (prevalence declined by 12% to 44%, but participation rate in cross-sectional surveys was relatively small (no cohort analysis); Economic analysis (see chapter 6): only 6 of the studies identified reported economic data, 5 from the USA, one from Australia 4 studies: information on program costs only, varied between US\$1.500 for smoking cessation program offered 4 times in 2 years and US\$26.867 for group cessation study conducted in 1989: material costs + lost employee time to participate were approx. US\$50 per employee, costs of program implementation for group 1 (brief counseling+ self-help material) and group 2 (as 1 + monetary bonus) approx. US\$9.500 (50x190 per combined group), estimated savings with quit rate of 5.8% US\$9.000 (9 employees at US\$1.000), estimated costs in group 3 (as 1 + intensive counseling + buddy selection + contract) and group 4 (like 3 + bonus) US\$9.500, with cessation rate of 15% (27 abstainers, each US\$1.000), estimated savings US\$27.000, in case of reducing benefit by 50% still savings of US\$13.500, still 40% more than estimated costs, return on investment for the most effective methods approx. 1:2 study conducted in 1991: direct intervention costs per year and employee for screening in control worksite (intervention: risk information and advice) US\$2.97, in worksite 2 (intervention: health education) US\$17.68, in worksite 3 (intervention: as worksite 2 + follow-up counseling) US\$30.96, in worksite 4 (intervention: as worksite 3 plus plant organization for health promotion) US\$38.31, worksites 3 and 4 estimated to be 10 times more cost-effective than worksite 2 for engaging participants, regarding risk reduction and relapse prevention 5 – 6 times more cost effective than worksite 2; Australian observational study: 2114 employees in public service, 6 departments, intervention: smoking ban and smoking cessation programs, reduction of daily cigarette consumption</p>	<p>less smoking may be associated with economic benefit in the form of less absences and increased productivity economic analyses difficult to compare, calculation methods vary from study to study, sometimes costs per abstainer compared only with smokers vs. overall staff as reference pure program costs are not sufficient as basis for the calculations, other costs disregarded cost effectiveness analysis performed in the USA have only limited validity for other health care systems</p>

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Moher et al. (2005) continued							<p>by 5.2 cigarettes on average, estimated savings when extrapolated to the entire public service assuming a smoking prevalence of 24.7%: smoked cigarettes reduced by 52 millions per year, which corresponds to a saving of A\$ 5.2 millions in addition to public health benefit in general</p> <p>only 2 studies provided information on efficiency outcomes such as absenteeism or improved productivity</p> <p>study 1: reduction in the percentage of employees who reported a sick day during the last month between intervention and control workites was 3.7% (cross-sectional analysis) and 3.4% (cohort analysis), participation rate and change in absenteeism positively associated (0.9), strongest in smokers, programs might have important short-term economic benefit</p> <p>study 2: comprehensive lifestyle intervention, outcome was mean number of sick days over the last 4 months of the first year of intervention, decreased from 6 to 2.9 in intervention group (difference sign.), increased from 4.5 to 7.4 in control group (difference sign.), but: smoking was not the only behavior targeted, effect cannot only be attributed to smoking cessation component</p>	
Fichtenberg and Glantz (2002)	Medline, Science Citation Index, Social Sciences Citation Index, Current Contents, Psycinfo, plus manual search in references of reviews and studies	26 studies from USA, Australia, Canada and Germany, reported in 14 papers, 21 workplace intervention studies, rest population studies	working population	prospective studies, sequential cross-sectional studies, retrospective population studies used cross-sectional design	workplace smoking bans		<p>data analysis: computation of differences in consumption per smoker and per employee and prevalence before and after implementing a workplace smoking ban or between comparable samples with different regulations in population studies; t-test revealed no different effects between workplace studies and population studies</p> <p>analysis of variance for comparing results from different studies: sequential cross-sectional studies reported significantly smaller changes in number of cigarettes per smoker than other study designs, but no difference between studies regarding prevalence, consumption per employee or relative change in consumption, therefore pooling all studies in a random effects meta-analysis</p> <p>Smoke-free workplace: reduction of the absolute smoking prevalence of 3.8% (2.8 – 4.7), decrease in consumption of 3.1 cigarettes per day (2.4 – 3.8) per continuing smoker, i. e. number of cigarettes smoked per day per employee reduced by 1.3, corresponds to a relative reduction of 29% (11%– 53%), time between implementation and follow-up ranged from one to 24 months, no significant correlation between effect and duration of the follow-up period, effect stable over time</p> <p>Comparison with tax increases: price increases by 10% results in a 4% decrease in consumption per capita, for achieving a reduction by 29%, cigarette prices would have to be increased by 73%, average tax per pack would have to be increased from US\$0.76 to US\$3.05 in the US, from £3.44 to £6.59 in the UK, but since workplace regulations concern the working population only and not the overall population,</p>	smoking bans protect non-smokers from passive smoking and help smokers to stop smoking

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Fichtenberg and Glantz (2002) continued	Centers for Disease Control and Prevention's Office of Smoking and Health website, Tobacco Control website, Medline, Science Citation Index, Social Sciences Citation Index, references of articles, books, reviews, interviews with experts	19 workplace intervention studies, 9 population studies on public clean air policies	working population	either pre-post design or cross-sectional comparison of exposed persons vs. non-exposed persons	clean indoor air laws (comparison of the effectiveness of public policies and workplace smoking bans)	population studies did not consider when bans were adopted, different types of bans were not distinguished, if states are highly committed to tobacco control it is difficult to say which part of the effect is attributable to the ban and what is caused by attitudinal change	effect of workplace smoking policies corresponds to a lower tax increase, only marginal effect if all workplaces were smoke-free: in the US, estimated reduction in consumption per capita would be 4.5%, in the UK 7.6%, for reaching this effect, a tax increase from US\$0.76 to US\$1.11 per pack in the USA and from £3.44 to £4.26 in the UK would be required 3 studies allowed to compare effects of total smoking bans and partial policies: total ban on smoking had about twice the effect	
Levy and Friend (2003)	Centers for Disease Control and Prevention's Office of Smoking and Health website, Tobacco Control website, Medline, Science Citation Index, Social Sciences Citation Index, references of articles, books, reviews, interviews with experts	19 workplace intervention studies, 9 population studies on public clean air policies	working population	either pre-post design or cross-sectional comparison of exposed persons vs. non-exposed persons	clean indoor air laws (comparison of the effectiveness of public policies and workplace smoking bans)	population studies did not consider when bans were adopted, different types of bans were not distinguished, if states are highly committed to tobacco control it is difficult to say which part of the effect is attributable to the ban and what is caused by attitudinal change	workplace studies: decrease in cigarette consumption of 10-20% after 6 to 13 months, prospective cohort studies reported reductions in prevalence rates ranging from 7 to 20% after ban had been in place 1 year or more, effect on cessation rates less consistent <u>maintenance</u> of the effects: reductions in quantity smoked, greatest decrease within the first 6 months, then slow decline, on the contrary, prevalence and cessation rates show no or no immediate effect, but increase over time (evidence for this trend is less consistent) overall, there is considerable variation regarding different outcomes results hard to generalize population studies of worksites: in most cases, random selection of employees from a rather large region (e.g. population of a state in the USA or entire country), they might be more representative (there can still be differences between the sectors, but not between individual firms), disadvantage: cross-sectional design, no information on how long ban has already been in place, but in general, long-term effects were examined because smoking behavior was assessed over a period of time (possibility of control given: adjustment for confounders) consistent results regarding reduced cigarette consumption, range 7-15%, larger effects in studies without adjustment lower smoking prevalence in firms with ban than in companies without, e.g. 15-20% difference workers in firms with bans had higher rates of quit attempts and successful attempts lasting for at least 3 months, higher abstinence rates, but some studies did not find any associations partial smoking bans: no or only small effects, in case of strict regulation consumption was reduced by 10-15%, prevalence by 15-20% compared to companies without ban	Summary: strict smoking bans reduced daily cigarette consumption by 10-15% and prevalence by 15-20% compared to worksites without ban, in most cases, cessation rates increased by 10-15%, effects associated with working hours, dose-effect relation is likely Smoking bans promote lower overall cigarette consumption, (was reduced by 4-20%), prevalence reduction and higher cessation rates worksite Intervention studies rarely show changes of prevalence, but cross-sectional population studies provide clear evidence Implications for further research: study social norms as influence factor, examine long-term effects, use valid instruments

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Hey and Perera (2005)	Cochrane Tobacco Addiction Group Specialized Register, MEDLINE, EMBASE, CINAHL, PsycINFO, manual search in specialist journals, grey literature	15 studies	adult smokers	9 RCT, 6 controlled studies (5 studies in medical facilities, rest in worksites)	incentives and competitions for smoking cessation: lottery tickets, cash payment for successful quit, payment plus site-wide prize draws, varying amount of deposits and repayment, comparison of the effect of different amounts of money, payment for participation without refund, max. achievable cash reward higher than participation fee, awarding depending on team performance, 7 studies rewarded participation and compliance	studies often have too little power, very large variability in study quality	<p>none of the studies found an effect of monetary incentives, rewards or competitions at last follow-up point</p> <p>some studies found short or medium term effects on cessation rates in intervention groups, but effects were not sustainably, single study which found long-term effect was non-randomized and had only small sample size</p> <p>meta-analysis performed with 9 studies, grouped by follow-up points:</p> <p>after 6 months no sign. effect, but confidence interval (CI) indicates clinical relevance, 2 studies found sign. effects (but in both final reward was paid at the follow-up point)</p> <p>after 12 months or longer no significant odds ratios and narrow CIs for the studies were adjusted</p> <p>consistent picture showing that monetary incentives an/or competitions are only effective as long as they are present and when they are no longer offered the usual relapse pattern reemerges</p> <p>rates of participation in incentive groups were partly twice as high as in control groups, but is not reflected in sustainably higher abstinence rates</p> <p>nearly all studies use biochemical validation of smoking cessation (precondition to get reward or prize); 3 studies showed good correspondence between claims of abstinence and tests (95%-100%), 2 studies showed remarkable discrepancy, but: in both studies persons were not warned</p> <p>cost analyses:</p> <p>efficiency of incentives as separate component not determined</p>	workplace offers number of advantages for smoking cessation: easy access to target population, occupational health support, peer support, reward systems can easily be set up because of existing salary structure, lower risk of deception material and monetary incentives as well as competitions do not contribute to improve sustainability short-term effects disappear when the incentive no longer is present and the smokers relapse into their old smoking pattern incentives and competitions seem to increase number of participants and successful quitters only small evidence that levels of deception vary between experimental and control group or that the rates of disconfirmation are unacceptably high
Rey-Riek et al. (2003)	Medline, ETOH, SOMED, Nebis, writing to experts, homepages of health institutions (1965 to 2003) empirical studies, theoretical essays, bibliographies and monographs		working population		employee assistance programs (EAP) for workplace prevention of alcohol problems	aim was meta-analysis of German-speaking literature, could not be performed since not enough papers were identified, so qualitative analysis was done larger number of studies conducted in North America (but also no exhaustive knowledge on effectiveness of EAP): 2 reviews found, one analyzed 11 studies from the late 1950s to 1984, second one analyzed 13 studies published since 1975, both conclude that organizations benefit from EAP, but it is difficult to prove that workplace alcohol programs actually reduce costs (due to shortcomings in study designs) other authors also conclude a clear association between constructive confrontation strategy and work performance and that EAP can bring affected employees to appropriate treatment studies from Germany: most workplace substance abuse prevention programs are not evaluated systematically, only case studies or descriptions available, focus on analysis of costs due to sickness absence, other alcohol-related consequences not taken into account, nevertheless, studies report reduction of alcohol-related sickness absence and concomitant economic benefit of the intervention	alcohol abuse prevention pays off regarding sickness absence considerable need for extended calculations of productivity and more complex analysis procedures EAP have mainly proven themselves in large companies (> 1.000 employees), but there are many small and medium-sized companies in Switzerland, therefore more offers for companies of this size needed EAP are appropriate to tackle alcohol-related problems, but more suitable interventions are required for truly preventing the disorder suggestion: implementation of brief interventions (effectiveness has proven in several meta-analyses, sustainability confirmed in recent studies as well as cost effectiveness)	

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Rey-Riek et al. (2003) continued							<p>studies from Switzerland (for economic aspects see chapter 6): literature situation similar to Germany, one relevant study (already older): comparison of a group of alcoholics with a 3 times larger control group (case control study), outcomes were sickness absence and illness, demonstrated associated excess costs (approx. 1.525 € per person per year)</p> <p>cost calculation in another study: company employing 100 people, 4.3% are alcohol-addicted employees, estimated performance loss 1/3, overall burden for company 157.000 € plus compensation costs for early retirement (approx. 570 €), annual overall damage per employee: 2.140 €, costs of a suggested EAP program with a duration of 10 years amount to 19.667 € per employee, compared with an estimated overall damage of 21.400 € in case of no intervention, breakeven point would be reached after 4.3 years</p> <p>to calculate company overall costs due to alcohol-related sickness absence, inability to work and work accidents authors often use a model of the Stanford Research Institute (SRI), estimates alcohol-related costs in relation to an employee's occupational position, assumes a global reduction of 25% of the salary</p> <p>several authors point out that, based on this formula, the estimated costs have to be considered as rather being too low compared with the real costs (reason: costs are difficult to quantify, those caused by low quality of work, breakdown, standstill, wrong decisions, bad working climate or replacement of sick employees or employees unable to work are not included)</p>	
Katz et al. (2005)	studies from 1966 to 2001, publication language: English, no further information on databases given	20 studies			Interventions for preventing and control of overweight in school and worksite settings		<p>based on the results of seven papers the Task Force on Community Preventive Services recommends that dietary and exercise-related approaches should be combined to control overweight and prevent obesity</p> <p>successful interventions often involved the following components: dietary education, aerobic or strength training exercise prescription, behavioral training, self-directed material, specific dietary prescription, supervised group exercise; 2 studies reported cost-benefit analysis: it costs <US\$1 per employee per year to activate 1% of the population at risk on account of too a small number of studies, insufficient evidence exists for the effectiveness of single-component worksite interventions focusing nutrition, physical activity or other behavioral interventions</p> <p>criterion for success of the program focused only on weight loss, i.e. some of the studies may have effected positive results regarding other target figures that were not included in the subject matter of the present review</p>	<p>Task Force on Community Preventive Services recommends a combination of dietary improvement and increase in physical activity, evidence for effectiveness exists</p> <p>lack of studies on the primary prevention of overweight</p> <p>many additional programmatic and strategic research efforts are required for controlling overweight</p>

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Pelletier (2001)	Medline, ERIC, ADI, EDGAR, CARL, Inform, Lexis-Nexis (1998-2000), inquiring experts	12 studies, 3 additional papers from previous review	working population	1 experimental study, 2 quasi-experimental, 9 non-experimental studies, studies on comprehensive programs reporting health and cost outcomes included only	comprehensive worksite health promotion programs	all studies used individuals as the unit of analysis, even when study was cluster randomized, differential attrition from the sample	Health risks: general reduction of employee risks for chronic disease decrease in glucose levels and (glyco) hemoglobin lower influenza rates and less influenza complications decreased number of headaches smaller number of caesarean sections, preterm deliveries and underweight newborns reduction of sick days reduction of doctor visits and hospital days ROI (also see chapter 6) 1:4.56 – 4.73	overall assessment: “indicative” evidence for positive clinical and cost effects
Pelletier (2005)	Medline, ERIC, ADI, EDGAR, CARL, Inform, Lexis-Nexis (2000-2004), inquiring experts	8 studies	working population	1 experimental study, rest quasi-experimental studies, cohort studies or non-experimental studies studies on comprehensive programs reporting health and cost outcomes included only	comprehensive worksite health promotion programs	considerable decrease in number and quality of studies might be the result of difficulty to gain endorsement, but: systematic evaluations desirable and required problem of publication bias might be more important if only a few studies are published	Development trends: → reduction of the number of RCT conducted in worksite settings → trend towards to simple observation studies with pre-post design on disease management programs on areas of specific importance to employers (show innovative possibilities) → trend towards studies which use a comparison of participants and non-participants → increased interest in mental health topics → development of new measurements to link medical costs and productivity costs, as well as more sophisticated integration systems → significant increase in international workplace health promotion and programs (in particular Ireland, Denmark, Japan) → core element of comprehensive programs: individualized risk reduction with special attention to high-risk employees → focus: disease management with persons at high-risk, combinations of public-health strategies and individualized behavioral risk management and telemedicine, most likely to produce a positive ROI (3 of 8 studies report a positive ROI) → overall, the majority of the studies shows health-related and economic benefit → future implications: comprehensive programs involving high-risk interventions, should focus on a dose-response model of increasing levels of intensity	comprehensive programs are associated with positive health outcomes and cost benefit

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Engbers et al. (2005)	Medline via PubMed, Embase (up to January 2004)	13 studies	healthy workers/employees, both blue-collar and white-collar	RCT, CTs	comprehensive worksite health promotion programs with environmental changes (8 studies on cancer risk reduction, 3 studies on cardiovascular risk reduction, 1 study on lowering serum cholesterol levels, 1 study on promoting a healthy lifestyle in general, in most cases mixture of educational interventions (e.g. group sessions and skills training), counseling, incentives and information for increasing health awareness (flyers, brochures, kick-off events, presentations, newsletters, seminars), one study comprised a policy change (on smoking), one included a family counseling	most frequent shortcomings: no blinding of the outcome assessment, problematic outcomes (5 studies), poor description of company characteristics (7 studies), no study described randomization procedure, hardly any information on the validity of the outcome measures, insufficient description of interventions (e.g. no detailed information on the kind of information provided on point-of-purchase signs etc.) publication bias cannot be ruled out	<p>levels of evidence: strong (at least 2 high quality (HQ) RCT with consistent results), moderate (1 HQ RCT and at least 1 low quality (LQ) RCT or 1 HQ RCT and at least 1 HQ CT with consistent results in both cases), limited (1 HQ RCT plus at least 1 LQ CT or more than 1 LQ RCT or more than 1 HQ CT, in each case with consistent results), inconclusive (only 1 study or several LQ CTs or with inconsistent results) and no evidence (more than 1 study with consistent results that no significant or relevant results were found)</p> <p>Physical activity: 3 LQ studies found, a program involving a walking track on company grounds showed no change in exercise behavior (days of exercise and/or distance covered per day), program aiming at general improvement in physical activity; sign. increase in self-reported activity (at least 20 min. of continuous exercise three times a week or more times) and exercise behavior (e.g. motivation and phase of change) in follow-ups compared with control group, strategy for promoting stair use contributed to sign. increase of self-reported activity (hours per week) (was observed in control group as well), stair use itself was not recorded → inconclusive evidence</p> <p>Nutrition: 13 studies, four outcomes: reported intake of fruit, vegetables, fat and dietary fibers 6 studies, 3 nearly HQ, all found sign. positive changes compared to control groups 6 studies on fat consumption, 2 HQ, sign. reduction in fat consumption found in all studies but one → strong evidence 1 study on fiber intake, no effect found</p> <p>Health risk factors: 4 studies, outcome were cholesterol levels (serum or blood), no effect found 3 studies on BMI, in 2 no sign. change found, one study found small, but sign. increase 1 study on blood pressure, no sign. effect → no evidence</p>	evidence for the effectiveness on dietary intake, but all programs evaluated comprehensive interventions, i.e. effect cannot be clearly attributed to the environmental component probably effective: labeling of healthy food, expanding food offer, using information material (brochures, poster), placing the food easily visible disappointing results for work-site health promotion programs with environmental changes regarding physical activity, reason: on the one hand, small number of studies, on the other hand poor methods (outcomes not directly associated to the program content) results of the review generally difficult to interpret, but: interventions at the workplace have to be comprehensive and intensive and consistently pursue environment factors in order to create health awareness at the workplace

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Aust and Ducki (2004)	10 German and international data bases: Psyn dex, S omed, OCLC- PsycFIRST, Medline, PsycLIT, ZPID database of dissertations, OCLC-Social Science Index, OCLC disserta- tions, OPAC of the German Library Frankfurt, psy- chological online documents	11 studies	working population	Wilson's approach, 5 categories (* to ***)	health circles (studies report on 81 health circles, more than half of them (43) conducted in steel industry, 12 in chemical industry, 5 in hospitals, remaining 21 circles in companies and organizations in various fields of the production sector, tele- communication and services)	only 3 of the 11 studies used control groups (not randomized), but even these used only simple evaluation procedures most frequently: before-and-after comparison by circle participants or these and several or all em- ployees in the depart- ments where the circle was carried out statistical analyses performed in 3 studies only, in most cases only report of frequen- cies despite limited use of reliable methods, a certain number of subjective and objec- tive outcomes was observed to evaluate the intervention poor methodical quality might be due to the fact that health circles are rather a practical design, strict evaluations are not seen as primary aim, circles are often initi- ated by the companies themselves, positive reaction of participants is considered to be a relevant outcome, acceptance among the employees who do not participate actively might be more reliable	majority of the circles conformed to the Düssel dorf model (73), 5 cor- respond to the Berlin model, in most cases model was only a general guide with individual changes according to the particular situation Satisfaction with health circles (HC): overall participants report great satisfaction with the composition of the circle groups, the number of sessions and the overall process of identifying problems and developing possible solutions in one study participants were satisfied with composition of the circle, but not with information flow within the company, in one study 40% of employees did not support the intervention Implementation of suggestions for improvement: 7 studies: 45% to 86% of suggestions were implemented within 6 to 12 months after the final circle session study on 41 health circles: highest implementation rate for sugges- tions to improve psychosocial situation (67% of all suggestions imple- mented after 6 months), followed by organizational and environmen- tal interventions (60%) and suggestions for reducing physical strain (54%), one study with rate of 86%: interventions comprised basic ergonomic (e.g. improved driver's seats), technical (e.g. improved air condition) and organizational (e.g. reduced ticket sale through driver) improvements, other examples of implemented interventions: introduction of team structure and job rotation to improve communication, wage increases, hiring more personnel during summer months, additional equipment, improvement of shower rooms, trainer for improving communication and management style in one study only a few suggestions implemented (but was one of the early pilot studies of Berlin model, study author's conclusion: further development required) Improvement of working conditions: except for one study aiming primarily at coping strategies, all studies found at least some improvements in work conditions, stress reduction as a result of improved work organization, physical strain was reduced by providing improved equipment, technical or ergonomic improve- ments, study on 41 HC: nearly 60% of all circle participants reported positive changes, additional 35% reported improvements of their work situation, survey of employees showed that 55% noticed some and/or significant improvements in social support and appreciation experi- enced, 53% reported improved equipment, 50% remarked improve- ments in decision latitude, further examinations in companies with already 6 HC: 48% of 156 improvement suggestions show positive cost-benefit ratio in most studies communication within the company and social support by superiors and colleagues improved, in one study only circle partici- pants reported improvements, in another study 60% did not remark any improvements (but survey was conducted before the major part of the interventions have been implemented) Health effects: 5 studies assessed effectiveness on health-related outcomes by self- rated health, one study also used objective measurements 2 studies with control groups, 3 performed statistical analyses	no demanding studies that evaluate health circles systematically results have to be inter- preted with caution (e.g. absenteeism influenced by a large number of fac- tors, if there is no control group, the effect is not clearly attributable to the health circle) but available data support the fact that circles result in ergonomic, techni- cal and organizational improvements as well as in reduced psychosocial stress, so it is likely that these positive effects can also influence the health of the employees implementation calls for comprehensive problem analysis, continuous staff information during the intervention and encour- aging explicit feedback is important, cooperation with the management is needed companies and researches seem to be convinced that health circles are successful and thus willing to invest time, money and energy intervention is very promising, health circles are accepted by employ- ers and employees, but: evidence base is weak, better studies required

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Aust and Ducki (2004) continued							4 studies had positive results: 40% of participants had some or considerable improvements in health state, substantial improvement in job satisfaction and self-effectiveness, statistically significant improvements for 3 stress indicators compared to control group, stat. sign. improvements in mental well-being and work satisfaction objective outcomes (triglycerides, cholesterol): stat. sign. improvements in pre-post comparison in participants Sickness absence: 7 of 11 studies, evaluation based on company or health insurance data, simple before-after comparison without statistical tests only 1 controlled study, absenteeism increased in both groups, 1 study no change, 5 studies substantial decrease (from 10.2% to 7.4%), sick days due to musculoskeletal diseases decreased from 2.000 to 1.000 days per 100 full-time employees, turnover rate decreased by 40% in one case reduction of absenteeism from 10% to 5%, saving of \$ 1 million, company attributed more than one third of this effect to HC, one study: increase in all departments, reduction of absenteeism only in circle department	on account of heterogeneity of methods, only limited evidence up to now the available data provide enough certainty to recommend that participatory ergonomic interventions should continue to be implemented since there is evidence linking work-related risk factors to the burden of musculoskeletal disorders any intervention proven to have at least a small positive effect is useful and should be implemented
Cole et al. (2005)	MEDLINE since 1966, EMBASE since 1980, CINAHL since 1982, CCINFO web, Safety Science and Risk since 1981, Ergonomic Abstracts since 1969	10 studies	any working population	rating of methodological quality (very high – 100%, high – 75-99%, medium – 45-74%, low – 0-44% of 16 quality criteria met) quality had to be at least “medium” one study had very high quality, one high quality, eight were medium quality	participatory ergonomic interventions, at least one relevant outcome assessed (pain/discomfort, musculoskeletal complaints, injury rates, accident/first aid rates, absenteeism, sick leave, work function/limitation of performance	recommendations for research: use of comparable control or reference groups whenever possible including randomization (if several organizations are involved) better description of study population better documentation of the level of participation within the organization, of the extent of involvement, of the extent and/or portion of those involved describe ergonomic changes as detailed as possible in order to increase comparability and transferability delineate risk factors and analyze their links to health parameters description of co-interventions and consideration of their impact in the evaluation description and adjustment of individual confounders	considerable heterogeneity in the evaluated interventions, in particular regarding duration, voluntariness and/or obligation to participate and role of ergonomist majority implemented changes in the physical design of equipment and workplaces, a smaller number of studies comprised task redesign, changes in work teams, in work organization, the implementation of new policies or specific trainings 6 studies involved interventions that could not be assigned to the classical categories: development of a stretching and exercise program, development of better strategies to maintain existing equipment, arrangement and implementation of new break rooms, cooperation with suppliers, in general participatory ergonomic interventions can be expected to include a certain number of interventions that cannot be easily categorized <u>musculoskeletal complaints and physical discomfort:</u> 1 Very High Quality (VHQ) study: positive, but small effect, 1 High Quality (HQ) small change as well, 3 Medium Quality (MQ) studies showed improvements, but no effect size can be calculated → limited (partial) evidence for a small positive effect on musculoskeletal complaints <u>injuries and worker's compensation claims:</u> 6 MQ studies, all show reduction in injury records and worker's compensation claims, in particular in the field of musculoskeletal disorders (e.g. low back pain), effect sizes ranged from large (in crude analyses) to small (in more differentiated analyses adjusting for staff turnover and co-interventions) → limited (partial) evidence (effect may be considerable or only small) lost work days and sickness absence: 2 MQ studies showed positive results, no effect size can be determined → limited (partial) evidence, but further research is needed to determine magnitude of the effect overall: 9 of 10 studies of medium or better quality reported positive effect on health outcomes	

Tab. A-2: Systematic reviews on the effectiveness of interventions to prevent mental ill-health

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
van der Klink et al. (2001)	Medline (1966 – 1996), CinPsych (1980 – 1996), Current contents (1997), Nioshtic (1970 – 1996) and manual research; language: English	48 studies	working population, n=3736	experimental or quasi-experimental with no-intervention control group	4 types of interventions: cognitive-behavioral methods (18), relaxation techniques (17), multi-component programs (8), organizational interventions/environmental changes (5) intervention level: I,0	specific data such as age, gender, profession not provided in the original studies; follow-up periods in studies examining organizational interventions	individual level: cognitive-behavioral interventions → more effective than relaxation techniques and multimodal programs; organizational level: → no effect determined	
Proper et al. (2002)	Medline, Psychinfo, Sportdiscus, OSHrom, Cisdac (1980 – 2000) completed with references of other studies and personal databases search language: German, English, Dutch	12 publications on 8 studies	working population. both blue-collar and white-collar	randomized-controlled (RCT) or controlled trials (CT)	interventions for the promotion of physical activity and/or physical ability; 3/4 of the RCT: combined programs of aerobics, strength & mobility; 1/4 of the RCT: only aerobics; 4 CT involved different types of programs; intervention level: I	poor methodical quality of the RCT/CT; insufficient description of randomization procedures and inclusion criteria; drop-outs; poor compliance; in part too small random samples	absenteeism: → limited evidence; job satisfaction: → no conclusive evidence; work stress: → no conclusive evidence; productivity: → no effects; fluctuation: → no conclusive evidence (only 1 CT)	
Mimura and Griffiths (2003)	among others, Cochrane Library, CINAHL, Medline, Psychinfo (since 1990) language: English and Japanese	10 studies	nursing staff	randomized-controlled studies (6), prospective cohort study (1), auxiliary studies (3)	various interventions such as education, role plays, relaxation, music, sports, cognitive techniques, individual and organizational interventions intervention level: I, 0	poor methodical quality of the studies → in part conclusions are not feasible and/or possible	individual level: physical activity, music and relaxation → potentially effective; cognitive technique → weak evidence; social support measure → inconclusive	more evidence for the effectiveness of individual level interventions than for organizational level interventions; it is not possible to determine what kind of approach is more effective → number of studies is too small

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Michie and Williams (2003)	Medline, PsycInfo, Cochrane Trials Register, Embase (1987 – 1999) language: English	49 studies including 6 referring to interventions	mainly health care workers, completed by other professional groups	RCT, randomized-uncontrolled study, observational study, matched-controlled study	aerobic exercise and stress management training, sessions to teach skills to enhance social support and problem solving, communication training; identification of key factors associated with psychological ill-health intervention level: I, 0	only one of the studies comprised an economic evaluation	improvement in stress management, improved working climate, reduced depression, decrease of stress hormone levels, reduced sick leave identified key factors: work overload, work pressure/time pressure, long work hours, conflicting demands, lack of control over work, lack of participation in decision making, poor social support, intransparent management	individual trainings and organizational modifications → successful in promoting mental well-being and reducing sick leave
Giga et al. (2003)	PsycInfo (1990 – 2001), Medline (1990 – 2001) language: English	16 studies (exclusively from England)	working population	randomized-controlled studies, without randomization or control group	individual level: e.g. cognitive-behavioral methods, relaxation, time management, EAP; individual-organizational level: e.g. participation; organizational interventions: communication, job redesign intervention level: I, 0	in most cases, interventions were evaluated over a short period of time only; long-term effect of comprehensive programs not evaluated; only a small number of studies comparing different levels of intervention; in most cases follow-up at 6 months only	reduction of anxiety and depression; increase in productivity; reduction of sickness absence	no clear conclusions regarding the effectiveness of the specific intervention levels; combination of individual-organizational and organizational level interventions tend to more improvements for employee health and business performance; individual-level in most cases only short-time benefit to the individual
Caulfield et al. (2004)	EBSCO Host (1993 – 2003) language: English	6 studies (exclusively from Australia)	working population, professional groups: police officers, nursing staff, employees in public service	remains unclear	individual level (5) e.g. relaxation techniques, biofeedback organizational-level interventions (1) intervention level: I, 0	voluntary participation reduces effectiveness of individual-level interventions; only one study on organizational-level interventions; mainly self-reports	individual-level interventions do not lead to a clear reduction of work-related stress; reduction of stress through changes in working conditions, job redesign and changing the organizational structure, besides, more employees benefit from the intervention	
Jordan et al. (2003)	PsycInfo, Medline (1990 – 2001) language: English	74 studies	working population	47% without control group, 53% randomized-controlled or controlled without randomization	mainly individual-level interventions, completed by combination of both levels and a study on an organizational-level intervention intervention level: I, I/0, 0		interventions only lead to a small and/or short-term benefit if the necessity and the need for the program are not analyzed before; individual-level interventions have a short-term effect, in case of permanent offers more long-term effects; clear evidence for the necessity of inclusion of organizational-level interventions	

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
LaMontagne et al. (2006)	Medline, ISI Web of Science (1990 – 2005) language: English	95 studies completed, extension and update of Jordan et al. (2003)	working population	various study design (ranging from qualitative case studies to RCT)	individual-level interventions (e.g. teaching coping strategies, Employee Assistance Programs), individual-organizational level interventions (e.g. employee participation) and organizational-level interventions (e.g. reduction of work load) intervention level: I, I/O, O	only limited description of the intervention (literature focused on the description of evaluation methods)	individual-focused interventions with little or no primary prevention (PP) → benefit to the individual; individual-focused interventions with little or no PP → tend to have no positive influence on the organizational level; organizational-focused interventions with mainly PP, completed by secondary prevention (SP) or tertiary prevention (TP) and interventions with PP only → positive influence on both levels; I/O level → economic evaluation showed positive results	combination of individual- and organizational-focused interventions more effective for employees and employers
Seymour and Grove (2005)	PsychInfo, Nioshtic, Ciscodoc, Medline, Cinahl, Sociafile, ASSIA, IBSS, Cochrane, Business Source Premier, Emerald, Pub-Med, EMBASE (1980 to April 2004) language: English	31 papers	working population	experimental studies (19), non-experimental and narrative studies (12)	work-based interventions and those that affect employment intervention level: I, I/O, O	often poor methodical quality of the studies; selection bias; small sample sizes; often self-report; short intervention period; limited follow-up period; only limited information on the individual interventions; hardly any information to which degree results can be generalized (cultural characteristics, different professional groups, workplace conditions); few studies on organizational-level interventions	individuals and organizations benefit from stress intervention measures → "moderate evidence"; individual interventions are less effective compared with comprehensive measures → "limited evidence"; effectiveness of multimodal approach → "moderate evidence"; organizational-focused interventions benefit to the individual → "limited evidence"; individual-focused interventions are effective for employees at high risk → "strong evidence"; effectiveness of physical activity programs → "limited evidence"; effectiveness of cognitive-behavioral interventions for rehabilitation → "strong evidence"; positive effects of cognitive-behavioral approaches on absenteeism → "strong evidence"	

Tab. A-3: Systematic reviews on the effectiveness of interventions to prevent musculoskeletal disorders

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Karsh et al. (2001)	Psychlit, Engineering Index, Medline (until January 1999) language: English	101 studies	employees at a work-place	experimental, quasi-experimental, observational with or without pre-post design, non-equivalent control groups or pre-experimental design	ergonomic interventions to reduce musculoskeletal disorders or to affect risk factors for MSD	lack of confound control, stratification, measurement of between group differences at baseline, but: experimental standard difficult to realize in field studies, other designs are also noteworthy	<p>8 studies on back belts: 50% were randomized, four studies found no evidence that belt affected e.g. back injuries, pain, lost work days, 2 studies had mixed results, 2 studies had positive results</p> <p>21 studies on ergonomic training: 7 studies were randomized, 5 studies found no effect on e.g. body mechanics, back injury rates, lifting on the job, 14 studies found mixed results</p> <p>10 studies on tools: all studies were non-randomized, 4 studies found positive results e.g. for incidence of back injuries, lost work days, severity rates, 5 studies found mixed results</p> <p>14 studies on physical exercise: 7 studies were randomized, 4 studies found positive results e.g. for lost work days, pain, back muscle strength, 6 studies had mixed results</p> <p>1 study on job redesign: only one of the four outcomes changed</p> <p>47 studies on multi-component programs: 2 studies were randomized, 19 studies found positive results on e.g. incidence rates of upper limb disorders, nursing practice, use of manual handling equipment, reduced back injury rates, 27 studies found mixed results, one found no improvements at all</p> <p>84% of all studies found some positive results, 50% of the back belt studies found at least some positive results, 67% of the training studies found some positive results, 90% of the tool studies found some positive results, 86% of the exercise studies had some positive results, 97% of the multi-component studies yielded some positive results, 32% of the studies used experimental or quasi-experimental designs</p>	The question whether ergonomic interventions to control MSDs are effective can be answered with a qualified "yes" if one chooses to examine only the most methodological rigorous studies, the effectiveness of back belts and training interventions would have to be doubted

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Hess and Hecker (2003)	Medline (1975-2001)	3 studies	working population, (firemen, industrial workers)	quasi-experimental, pre-post design without control group	stretching programs for improving flexibility and reducing musculoskeletal disorders (MSD)	poor study quality in 2 studies flexibility was not correlated to interesting outcomes (e.g. MSD incidence)	programs lead to improved flexibility and increase in strength, 1 study found significant difference in injury-related time-loss costs	in addition to flexibility, increase in strength might also be important, when shorter periods of sickness absence really are associated with stretching → possible approach for the reduction of long-term sickness absence
Silverstein and Clark (2004)	PubMed, OSH-ROM, EMBASE, Ergonomic Abstracts on Line, Social Science Index (1990-2003)	17 reviews (1990-2003), 20 RCT and 17 quasi-experimental studies (1999-2003)	working population	systematic and narrative reviews, RCT, quasi-experiment	all interventions that are applied for prevention of MSD	in the individual studies: short follow-up periods, small sample sizes, high drop-out rates, no adjustment of potentially confounding factors	no summary of partial results given	multimodal programs → most promising approach
van der Molen et al. (2005)	Medline, EMBASE, HSE-line, Nioshtic (1990-2003)	46 publications on 44 studies	employees in professions with physical work demands due to manual handling at work, industry and nursing	experiment, quasi-experiment, laboratory and field studies, pre-post design, post design	ergonomic measures for reducing physical strain and associated musculoskeletal disorders: technical, administrative, individual implementation strategies: informational, compulsory, educational, persuasive, facilitating		technical engineering controls reduce physical demands, causal connection with musculoskeletal disorders not proven without doubt, combination of technical auxiliary equipment with educational implementation strategies (e.g. training) and facilitating strategies (e.g. availability of the auxiliary equipment) recommended	reduction of physical demands and back pain by providing technical lifting devices, positive results when participative ergonomic approach is involved, educational or training program or both with direct involvement of the employees/target group is recommended
Haidunen (2003)	PubMed	9 reports	health care workers	pilot studies, intervention studies, report on the results observed in one center of a multi-center study, program evaluations	lifting teams in health care facilities	none of the studies meets minimum methodological quality criteria	Incidence rates/costs: reduction of absenteeism, saving of medical costs Staff/patient satisfaction: high satisfaction in all studies Lifting team performance: team absorbed 88-95% of all lifts that had to be performed, time from call to lift: 5-6 min., time to complete lift: 3.5 – 4 min.	due to the lack of methodologically strict studies the effectiveness of lifting teams cannot be determined definitely, but it is a promising approach, recommendations: careful selection of the members, intensive training, supporting institutional policy (administrative requirements, nurses not allowed to perform transfer activities etc.)
Hignett (2003)	Medline, AMED, Psycinfo, Ergonomics Abstracts, EMBASE, CINAHL, British Nursing Index, Best Evidence (1960-2001)	63 studies	health care workers	remains unclear (only information on percentage reached in the methodological quality ranking given)	Interventions to reduce MSD associated with handling patients, technique training based interventions, single factor interventions and multifactor interventions		technique training: → ineffective (strong evidence) single factor interventions: provision of auxiliary equipment → moderate evidence for effectiveness Lifting Team → moderate evidence for effectiveness multifactor interventions: → moderate evidence for effectiveness, more successful when based on risk assessment	programs based primarily on technical trainings are not effective, should better be replaced by alternative interventions (taken from the seven most frequently used interventions included in the suggested generic multifactor intervention program)

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Bos et al. (2006)	Medline, EMBASE, CINAHL, WebScience (1985-2005)	13 studies	health care workers	RCT, CCT or CT 11 high-quality studies	interventions for the primary prevention of musculoskeletal disorders in health care workers; training/exercise had to be part of the intervention	limitations of the studies concerning design, characteristics of random samples, outcomes, risk of recall bias is given on account of retrospective questioning	→ strong evidence that interventions lead to less physical discomfort, improved patient transfer technique and reduced frequency lifts → inconsistent evidence that interventions reduce absenteeism due to MSD and musculoskeletal symptoms, fatigue, perceived physical strain and increase knowledge of risk factors and ergonomic principles → training/exercises in combination with ergonomic interventions proved potentially effective	training as single measure does not affect relevant outcomes such as MSD incidence multifactor programs should be preferred
van Eerd et al. (2006)	Medline, EMBASE, CINAHL, Academic Source Premier (1990-2005), Publication language: English	31 studies identified, 28 included evidence synthesis	computer users, traditional office setting	RCT, CCT, crossover design, 9 high-quality studies	interventions for the reduction of musculoskeletal symptoms in computer users	participation rates too low, lack of adjustment of potential confounders, no documentation of group differences at baseline	neck school, stress management training, new office, new office chairs, VDT glasses (only 1 study each): → "insufficient evidence" found ergonomic trainings rest breaks, arm supports, alternative keyboards, screen filters: → "mixed evidence" found workstation adjustment: → "moderate evidence" against preventive effect alternative pointing devices: → "moderate evidence" for preventive benefit ergonomic training + workstation adjustment, lighting + workstation adjustment + VDT glasses: → "insufficient evidence" (only 1 study each, positive effects) breaks + exercise: → "insufficient evidence" (only 1 study, no effect)	"mixed evidence"; conclusions are very difficult on account of extremely heterogeneous interventions recommendations concerning alternative pointing devices under reserve, since different mouse models were evaluated in part, for several interventions already 2 high-quality studies could improve the evidence basis (in particular rest breaks, ergonomic trainings, alternative keyboards, arm supports)
Leonard-Dolack (2000)	remains unclear	6 reports	employees at risk for work-related musculoskeletal disorders of the neck and upper limbs (cumulative trauma disorders)	pre-experimental, not randomized, controlled	trainings for preventing cumulative trauma disorders	studies methodologically not reliable, no control groups, no statistical evaluations	training should include active exercises, demonstration of the behavior to be learnt might be favorable, exercise effects might depend on the type of tasks	up to now no evidence for the effectiveness of educational measures for the prevention of cumulative trauma disorders

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Linton and van Tulder (2001)	Medline, PsycInfo Arblne (1967 – 1998)	27 studies	working population	19 RCT, rest CT	all interventions for the prevention of work-related neck and/or back pain (back schools/trainings, exercise programs, supporting belts, ergonomic interventions)	methodical quality not assessed because assessment has already been made in other reviews	back schools/trainings, lumbar supporting belts: → “strong evidence” against a preventive effect exercise/physical activity programs: → “strong evidence” for a preventive effect ergonomic interventions: → no evidence since no relevant controlled studies could be identified	exercise programs seem to be the only suitable prevention
Gatty et al. (2003)	CINAHL, EBSCO Online Citations, EBSCOhost, ERIC, Health Source: Nursing/Academic Edition, MDConsult, Medline (1995-2000)	9 studies	working population	RCT, CT, retrospective cohort study, pre- and without control group	interventions were attributed to one of 3 categories: supporting belts training + task modification, training + task modification + workstation redesign	-	back belts: → not suitable, 75% of all results: no effect comprehensive programs: → promising when tailored to the job tasks and the employee’s specific needs → trainings as element should be intensive, continuous and related to the job tasks	back belts not applicable as universal prevention instrument, tailored approaches recommended, e.g. workstation redesign and task modification, contents have to be related to job tasks in any case
van Poppe et al. (2004), update of 1997	Medline, ERIC, EMBASE, PsycLitt (1997-2002)	16 studies	working population	RCT, CT	lumbar supports, education, exercise programs	rather poor study quality, compliance problems, lack of blinding, inappropriate randomization procedures	lumbar supports: → “no evidence” education: → “no evidence” exercise programs: → “limited evidence” for preventive benefit, → magnitude of the effect was moderate, effect size of 0.53 for incidence	disappointing evidence base, only exercise programs effective

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Lühmann et al. (2005)	Medline, EMBASE, AMED, BIOSIS, MEDIKAT, Serline, gms, Sozialmedizin, CAB Abstracts, ISTPB-HSTP/ISSHP, Derwent Biotechnology Resource, Elsevier BIOBASE, ETHMED, GLO-BAL Health, Deutsches Ärzteblatt, EMBASE ALERT, ScSearch, AZO-Leitlinien, CCMed, Social Search, Karger publisher database, Kluwer publisher database, Springer publisher database, Springer publisher database PrePring, Thieme publisher database, Cochrane Library Online Version: CDSR, DARE, CENTRAL, Methodology Reviews, Methodology Register, HTA, NHS EED, About	15 systematic reviews, 16 controlled studies	working population with or without back pain aged 18 to 65	HTA reports, systematic reviews, evidence-based guidelines, RCT, controlled studies, economic analyses	interventions to prevent back pain at the workplace used for relapse prophylaxis and symptom progression: education (groups), brochures, cognitive-behavioral approaches etc.), physiotherapy („remedial gymnastics“), sports, risk factor interventions, ergonomic interventions, workplace-organizational interventions, orthoses and auxiliary devices	quality of the included studies varied remarkably, most frequent shortcomings are selection bias and lack of adjustment for potential confounders, studies on organizational-focused approaches were generally of poorer quality than studies on individual-focused approaches	<p><u>training/exercise programs:</u> 3 systematic reviews, 6 controlled studies, mainly positive results, effectiveness depending on regular, uninterrupted continuation of the programs, larger effects can be expected in high-risk groups, no reliable analyses on cost effectiveness education/information: 4 systematic reviews, 3 controlled studies, educational interventions aiming at knowledge transfer, for instance on body mechanics or load handling, are not suitable for the prevention of back pain. inconsistent results for effect of traditional back schools on absenteeism, possibly short-term positive effects on the incidence of new episodes</p> <p><u>multi-component programs:</u> 1 system. review, 3 studies, training + information + behavior therapy possibly positive effects on absences in high-risk groups, back school programs in workplace environment + intensive training units effect regarding new episodes and absences (probably attributable to effect of training component)</p> <p><u>lumbar supports:</u> 5 systematic reviews, no positive effects found in healthy working population on episodes of back pain, absenteeism, incidence of days with complaints, no statement on undesirable effects, possibly positive effect in persons with preexisting back pain</p> <p><u>lifting teams:</u> 1 systematic review, no studies with reliable design, approach has potential to reduce the burden of back pain in health care workers, but careful analysis of context factors required before (work content, process, structures, interactions of health care workers and patients, infrastructure)</p> <p><u>ergonomic interventions:</u> 3 systematic reviews, distinction of organizational approaches, individual approaches and combined approaches, no reliable results on organizational approaches (workplace redesign, changes in work organization) due to a lack of studies, individual ergonomic approaches not effective, combined measures proved successful in high-risk groups if participative component was included, but there is considerable need for methodically sounder studies</p>	scientific evidence on the effectiveness of preventive interventions for back pain still warrants study, strong need for further development concerning intervention design and evaluation methods

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
Maher (2000)	Medline, EMBASE, CINAHL, OSHROM, PEDro, PsycLit (up to January 1999), publication language: English	13 studies	workers in an industrial setting	solely RCT	education, exercise programs, lumbar supports, workplace modification + education	study quality considered as moderate	<p>lumbar supports: → “strong evidence” against preventive effect on sick leave, prevalence and severity of back pain education: → “moderate evidence” against a preventive effect on sick leave, severity and prevalence → “limited evidence” that back belts are ineffective in reducing costs exercise/physical activity: → “limited evidence” for an effect on prevalence → “moderate evidence” for an effect on sick leave and severity of back pain → no evidence for cost effectiveness, since only 1 study identified workplace modification + education: → no evidence for or against use, since only one study with statistical analysis found</p>	activity programs are currently the only workplace intervention with proven efficacy
Ammendolia et al. (2002)	Medline, EMBASE, HealthStar (up to June 2002)	10 studies	employees with physically demanding work, exposed to manual handling	5 RCT, 2 CT, 2 cohort studies, 1 survey	back belts	RCT: methodical shortcomings, no adjustment of potential confounders, no blinding, no intention-to-treat analyses, no adequate follow-up periods	<p>RCT report no or only marginal reduction of the incidence of back pain, sub-group analyses suggest positive effect in persons with previous complaints, methodically poorer studies also found no and/or only partial positive effects</p>	based on present evidence, no recommendation can be made for or against the use of back belts; compliance problem has to be resolved
Tveito et al. (2004)	Medline Advanced, PsycINFO, ISI base, Cochrane Controlled Trials Register (1980 to June 2002), publication language: English	31 studies	employees	controlled studies	back belts, educational interventions (mainly back schools) exercise, multi-component programs to prevent low back pain	inadequate randomization procedures, high drop-out rates, no blinded outcome assessment, no intention-to-treat analyses	<p>lumbar supporting belts: → no evidence for effect on sick leave, costs, pain, → “limited evidence” that there is no effect on new episodes of pain educational interventions: → “no evidence” for effect on sick leave, costs, pain → “limited evidence” for no effect on new episodes of pain physical exercise programs: → “limited evidence” for an effect on sick leave, costs, new episodes → no evidence for an effect on pain intensity multi-component programs: → “no evidence” for an effect on costs, new episodes → “limited evidence” for an effect on pain intensity → “limited evidence” that there is no effect on sick leave</p>	physical exercise programs and multifactor programs suitable for preventing low back pain

Authors	Data sources	Number of Studies	Study Population	Study design	Evaluated interventions	Methodological problems	Reported effects	Overall assessment
van Tulder et al. (2006)	Medline, CINAHL, Current Contents (until September 1999)	7 studies	employees aged 18 to 65 years	5 RCT, 2 CT	back belts for the prevention of low back pain	only 2 studies met more than 50% of the methodical criteria most common shortcomings: insufficient randomization procedure, no adjustment of co-interventions, compliance too low, no blinding of participants and outcome assessment	belt vs. no intervention no influence on incidence and absenteeism, "moderate evidence" for no preventive effectiveness belt vs. other intervention (education, instruction): → no influence on incidence and absenteeism, "moderate evidence" that belt is not more effective than other interventions belt plus other intervention vs. only other intervention: → no influence on incidence	supporting aids not suitable for preventing low back pain as well as not more or less effective than other interventions
Lincoln et al. (2000)	Medline, EMBASE, Nursing, Allied Health, NIOSHTIC, PsycINFO	24 studies	adults of working age and/or asymptomatic employees	RCT (laboratory + field), pre-post studies, controlled/not controlled, quasi-experiments	ergonomic interventions for the prevention of work-related carpal tunnel syndrome: engineering, administrative, personal, multi-component	too short follow-up periods (in particular in laboratory experiments), too small samples, no adjustment of potential confounders	technical interventions: → incidence not recorded, inconsistent results → alternative keyboards and key pads had no influence on pain and/or fatigue → positive medium-term effects found for alternative mouse, wrist support for mouse pad, negative slope keyboard support person-related interventions: → none of four studies proved positive effect multi-component interventions: → several studies reported reduced incidence of musculoskeletal disorders	multi-component programs seem to be the best approach for reducing the risk of developing carpal tunnel syndrome

IMPRINT

PUBLISHERS:

Federal Association of Company Health
Insurance Funds (BKK Bundesverband)
Kronprinzenstraße 6, 45128 Essen
Germany

Institute Work and Health of the German Social
Accident Insurance (Institut Arbeit und Gesundheit
der Deutschen Gesetzlichen Unfallversicherung)
Königsbrücker Landstraße 2, 01109 Dresden
Germany

Federal Association of Local Health Insurance Funds
(AOK-Bundesverband)
Rosenthaler Str. 31, 19178 Berlin
Germany

Association of Substitute Health Funds
(Verband der Ersatzkassen e.V.)
Frankfurter Str. 84, 53721 Siegburg
Germany

AUTHORS:

Ina Sockoll, Ina Kramer and Wolfgang Bödeker
BKK Bundesverband

LAYOUT:

Alexandra Shatup
BGAG - Institut Arbeit und Gesundheit der DGUV

INITIATIVE GESUNDHEIT UND ARBEIT

Internet: www.iga-info.de
E-Mail: projektteam@iga-info.de

IGA-Report No. 13e
1st issue – March 2009

ISSN: 1612-1988 (print edition)
ISSN: 1612-1996 (internet edition)

© BKK BV, DGUV, AOK-BV, vdek 2009