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The *Health and Work Initiative* is a co-operation agreement between the BKK Bundesverband (Federal Association of Company Health Insurance Funds) and the HVBG (Federation of Statutory Accident Insurance Institutions), whose objective it is to develop and enhance common approaches in the fields of prevention and intervention. The *Initiative* works on a project-oriented basis and an added value is its knowledge transfer to the fields of research, qualification and consultancy. This transfer of knowledge is predominantly made possible because these two partner organisations actively promote dialogue with trade and industry, policy makers, social insurance institutions, social partners and other institutions.

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Health-related and economic benefits of workplace health promotion and prevention

Summary of the scientific evidence

Julia Kreis und Wolfgang Bödeker



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BKK Bundesverband und Hauptverband der gewerblichen Berufsgenossenschaften
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1. Objective

The effectiveness of occupational health promotion and occupational safety and health measures as measured by the improvement of the employees' health and the success of the company is of particular significance for their acceptance. A systematic synopsis and appraisal are still not available. Whilst there are manifold effectiveness appraisals for behaviour-related prevention measures, particularly from the USA, evidence for the effectiveness of prevention by adapting the working environment is normally procured by means of isolated cases. The objective of this project by the Initiative Gesundheit und Arbeit (IGA – Health and Work Initiative) is to undertake a compilation of the evidence basis for behaviour-preventive measures and measures of prevention by adapting the working environment as provided by workplace health promotion and prevention. A literature study has been carried out for this purpose.

In the meantime, the call for evidence, i.e. the reliable standard of knowledge as to whether the anticipated targets are actually achievable using proposed and applied measures, is regarded as being up to date in many areas of medicine and social and public health. This complies with the credo of the so-called "evidence-based medicine", that is widely disseminated on an international basis by the Cochrane Collaboration. The Cochrane Collaboration is an international organisation aiming at carrying out systematic surveys on the effects of disease treatment and medical care, keeping these up to date and making them available. This is aimed at improving medical care. In the meantime, Cochrane Centres have formed in a multitude of countries and facilitate care and access to the extensive data bases. Whereas the original activities of the centres were closely oriented towards medical care and predominantly served the systematic appraisal of therapy studies, the fields of activity have now also expanded to health promotion and prevention. In addition to this, intervention results are no longer the exclusive subject matter of the compilation of knowledge, but also the evidence-based appraisal of methods and perceptions.

2. Search strategy ¹

Predominantly, the literature research, aimed at the German and English language area, was carried out on Internet assisted by Google, Metager and the MEDLINE expert electronic data base. In addition to this, we fell back on university libraries and the HBZ catalogue set up on Internet for those universities in the state of North Rhine-Westphalia. The in-house library belonging to the BKK Bundesverband was also reverted to during research as well as various internal archives.

Interesting projects or information were searched for on websites set up by institutions dealing with health promotion in the broadest sense. In addition to many smaller organisations, particular consideration was given to the Federal Ministry of Economics and Labour, the Federal Ministry of Health and Social Security and the Federal Ministry of Education and Research as contracting bodies for research projects, the Federal Institute for Occupational Safety and Health, the Social Science Research Center Berlin, the Social Research Office of Dortmund (sfs), as well as various institutions or health insurance and university faculties. Keywords, roughly outlining the topic, were chosen initially for the Internet search. The terms "evaluation", "health promotion", "public health", "metaanalysis", "prevention", "cost-benefit-analysis" and "effectiveness" were used. As the information offered on Internet for individual keywords was notably extensive and correspondingly complex, individual keywords were supplemented by further terms in order to narrow the topic down and several word combinations selected during the next stage. The search began, for example, using the term "health promotion", the word "workplace" was then added ("workplace health promotion") and the combination finally extended by further phrases ("effectiveness workplace health promotion", "cost effectiveness health promotion", "costs benefit workplace health promotion", "cost-benefit-analysis workplace health promotion" etc.

Finally, the following combinations of terms were chosen during the search strategy:

- Metaanalysis health promotion
- Metaanalysis prevention
- Cost-benefit-analysis (worksite or workplace) health promotion.
- Cost-effectiveness (worksite or workplace) health promotion
- Effectiveness (worksite or workplace) health promotion
- Effect measure health

¹ Our thanks go to Mandy Handschuch, Medical Service of the Central Association of Health Insurance Companies (MDS), for her assistance during the literature research.

- Evaluation prevention enterprise or worksite
- Evaluation health promotion enterprise or worksite
- Evaluation health programme
- Wellness worksite or workplace

Additional systematic appraisal of the following significant journals was carried out alongside the MEDLINE search for articles in international scientific journals, which were traced back to and including 1990:

- American Journal of Health Promotion (1996, issue 1-6; 1997, issue 3-6; 1998-2001)
- The New England Journal of Medicine (1994-2001)
- The Journal of the American Medical Association (JAMA; 1991-2001)
- Prävention (Prevention; 1993-2001)
- Zeitschrift für Gesundheitswissenschaften (Journal for Public Health; 1993-2001)
- Zeitschrift für Arbeits- und Organisationspsychologie (Journal for Industrial and Organisational Psychology; 1991-2001)
- Zeitschrift für Arbeitswissenschaft (Journal for Industrial Science; 1991-2001)

During the evaluation of the articles identified in this fashion, it could be seen that the applied keywords or scanned journals resulted in an abundance of individual studies and reviews on the field of behaviour prevention, but that hardly any of the articles could be allocated to the field of prevention by adapting the working environment. New keyword combinations were therefore used during the next stage in order to carry out new research using MEDLINE and the Science Citation Index. The following keyword combinations were used for this purpose:

- (Ergonomic(s) OR work environment OR workplace) AND (intervention OR evaluation OR effect OR effectiveness OR program)

The following keyword combination was only used for MEDLINE:

- (organi*ational change OR structural change OR job redesign OR job enlargement OR job enrichment OR job control OR job rotation OR work organi*ation) AND (intervention OR evaluation OR effect OR effectiveness OR program)

Contrary to the field of behaviour prevention, only one review was to be found in this way – in addition to a range of individual studies. Further deliberation on the literature search approach in this field and the appraisal of the result of the sources identified in this manner are to be found in detail in chapter 12 on the prevention by adapting the working environment.

3. Evaluation method

The following describes the approach or evaluation method decided on by the authors after appraisal of the identified sources.

Upon appraisal of the literature on behaviour prevention it was clearly obvious that there was also an abundance of so-called “grey literature“ in existence on this subject in addition to articles published in peer-review journals. This is to be understood as including, for example, project reports, publication of “models of good practice“ or descriptions of projects or measures in other contexts. It is common to all these sources that, as a rule, the methodical standard cannot be compared to the publications in scientific journals. Thus, in the majority of cases, exact descriptions are missing of the executed measures, the consequences, the determining factors etc. Insofar and from our point of view, a methodically sound evaluation of the effectiveness of the respective measures is not possible during the perusal of these reports. As, however, the question of the effectiveness is the primary objective of this project, we had to do without an appraisal of the “grey literature“. Instead of this the authors have confined themselves to the amply available so-called “white literature“, i.e. articles in journals allowing for the methodical quality by means of internal peer assessment, as actual statements can be made on the effectiveness of the respective analysed measures within the framework of controlled studies. It would be interesting to take up the “grey“ sources anew in a further research stage in order to appraise the propagation of occupational health promotion in Germany and the determining factors under which this is carried out. This, however, goes beyond the reach of the project at hand and would have to be addressed at a future stage.

Even after imposing a restriction to articles from peer-reviewed journals, a barely manageable abundance of individual studies in the field of behaviour prevention was identified and in addition to this more than twenty reviews. As the methodical grounding of the primary studies has been rendered in the latter and as they can also adequately represent the current state of research on account of their topicality (several reviews originate from 2001 and 2002), the authors decided – also in consideration of the time at their disposal – to carry out the appraisal of the effectiveness on the basis of the reviews at hand.

We abstained from appraising the “grey literature“ for the field of prevention by adapting the working environment for the same reasons as listed above. Similar to the field of behaviour prevention, the aim was to execute the appraisal on the basis of reviews, as it did not appear possible to carry out an appraisal on the level of individual studies on account of personnel resources. As already indicated above, the location of articles on prevention by adapting the working environment proved, in general, to be more difficult and the ultimate quantity of

search results to also be considerably lower. Nevertheless, for the purpose of a stringent evaluation method only the review was taken into consideration here.

The reported results that follow refer to the field of behaviour prevention for which well-founded statements can be made on account of the abundance of the identified survey work. As the findings for prevention by adapting the working environment are much fewer, the results in this field will simply be presented briefly in the final chapter in the sense of a forecast. Before presenting the results, a few remarks on the methodical claim of an evidence-based approach: Systematic reviews in the sense of the Cochrane guidelines constitute a standard instrument of “evidence-based medicine“ and are predominantly consulted for the appraisal of the effectiveness of handling measures and other interventions. These reviews do not simply differ from the literature compilation due to more comprehensive or assiduous execution. Systematic Cochrane reviews are aimed at avoiding distortion during the choice and involvement of studies, appraising the quality of the studies on the basis of criteria that has been defined in advance, providing an objective summary of the studies and finally arriving at a, where appropriate, temporary appraisal of the entirety of the knowledge in respect of the examined problem. In doing so the appraisals of the studies are carried out by at least two independent authors, who undertake to find a consensus in the case of varying appraisal.

Systematic Cochrane reviews do not inevitably view the results of individual studies as equivalent . They are assessed in respect of the applied design of the study. In this connection it is assumed that from the scientific-notional point of view certain study types must be allowed greater force of expression on the causality of the examined effects . For illustration purposes, the following table depicts an evidence class scheme, which is widespread in evidence-based medicine.

Widespread evidence class scheme of evidence-based medicine²

I	Evidence on account of at least one adequately randomised controlled study
II-1	Evidence on account of a controlled, non-randomised study with adequate design
II-2	Evidence on account of a cohort study or case control study with adequate design, if possible executed by several research centres or research groups
II-3	Evidence on account of comparative studies, comparing populations in different time segments or at different locations with or without intervention
III	Opinions of respected experts, according to clinical experience, descriptive studies or reports by expert bodies

² for example according to US Preventive Service Task Force or Canadian Task Force on the Periodic Health Examination

According to this, greatest evidence is accorded to randomised controlled studies . This study type is very widespread in clinical medicine and particularly suitable for intervention studies. If, in contrast, this concerns proof of impact contexts for instance between mental stress and health rather than treatments and intervention measures, it is partially impossible to carry out studies randomised and controlled. Outside clinical medicine, evidence class schemes are therefore also common that apply to widespread epidemiological study types. With the existence of prospective studies, the number of studies and the consistency of the results there is an increase in interrelation evidence.

It must be emphasised at this point that the reviews that are presented here do not comply with the methodical claim of the Cochrane reviews with the mentioned standardised approach: As already indicated in the objective, the activity fields of the Cochrane centres and with this the preparation of appropriate qualitatively high-value reviews have only recently expanded to the activity field of health promotion and prevention; currently, however, there are no comprehensive Cochrane reviews available. The issue of the approach in the presented reviews is therefore entered in item 6 "methodical approach in the reviews" as well as the associated insufficiencies.

4. General information on behaviour-preventive measures of workplace health promotion

The results reported on in the following refer to studies that follow the basic approach of behaviour prevention, i.e. those in which personal health-relevant behaviour comes to the fore as the starting point for prevention. It is thereby generally applicable that (workplace) health promotion programmes support people in acquiring healthy behaviour patterns whilst assuming that this will lead to an improved state of health (1).

In doing so, one can differentiate between those programmes focussing on individual risk factors (e.g. smoking, physical activity, nutrition) and so-called multi-component or multi-modal programmes offering a wide range of interventions each targeted at various risk factors. These risk factors can be associated with a certain disease (e.g. programmes for the reduction of cardiovascular illnesses or cancer prevention). This can, however, also involve completely different factors that are associated with health and well-being (2).

In the consistent enhancement of this approach, comprehensive health promotion programmes encompass all activities and political decisions within a company in relation to the health of the employees, their family and the community in which they live (Goldbeck, 1984,

cited according to (3)). Although the health promotion programmes in major companies are more comprehensive nowadays than in former times – thus for the most part include several components for different risk factors – the health of the individual employee (vs. the organisation) essentially still takes centre stage (3).

Generally, there are various aspects that make the occupational setting for health promotion measures particularly attractive. A few of the items mentioned in the following are itemised by Henrikus and Jeffery (4) in connection with the weight check behaviour range, but are also applicable to other health areas:

- At low cost, occupational measures can reach a great number of people, amongst these in particular being those persons, who would not seek professional help of their own accord.
- Companies offer easy access to persons – on the one hand on account of the given geographical concentration and on the other hand because available communication channels can be utilised.
- The occupational environment offers a range of unique possibilities for increasing the effectiveness of programmes, e.g. by means of social support from colleagues, due to positive enhancement of the changes in behaviour and due to the creation of beneficial environmental conditions (e.g. smoke-free zones, improved canteen food etc.). For example, “lack of time” is frequently stated as a reason for not participating in sports activities. On account of easy accessibility much less time is required to participate in sports courses at the place of work than in many other connections and a potential obstacle is thus removed (5).
- These programmes can also pay off directly for the company to the degree that absence conditional on illness or productivity restrictions are reduced due to health promotion programmes.
- An additional methodical benefit of the occupational setting is that there is an essentially better opportunity of the long-term follow-up of measures on account of the data available for the employees (e.g. absence due to sickness) than on programmes conducted by the communities, thus enabling more significant evaluation of the measures (6).

5. Current research status

A high number of studies are available, in particular from the United States, evaluating the workplace health promotion programmes on behaviour prevention. Simply within the framework of a series of survey articles that were published in the *American Journal of Health*

Promotion between 1996 and 1998, the authors were able to sift through more than 300 studies on this topic.

Contrary to the quantity, however, the quality of the studies on the face of it unfortunately often leave a lot to be desired. A description of some of the most frequent methodical deficiencies follows that substantially restrict the significance of literature at hand up until now.

a) Pre-experimental design excluding control groups

A main deficit is that a better part of the studies was carried out excluding a control group. The changes determined in the intervention groups on the basis of pre-post measurements are thus not to be marked off against social changes possibly taking place simultaneously (7), for example more movement, reduction of cholesterol intake, weight reduction etc. A promising success rate of 15-20% can thus be seen in withdrawal courses for smokers; if, however, one compares the intervention group with the parallel changes in the control group, only 5% (hence the net difference) can be put down to intervention (1). Ultimate determination of the effect of health promotion measures is thus not possible without a control group.

b) Duration of the follow-up period

All in all an inadequate number of studies are at hand that record the effects brought about by the programmes for a longer period of time (1). For example, less than half of the weight control studies provide data on the effects six or more months after completion of the intervention, even though the clinical literature has shown that this period of time is required as a minimum in order to even be able to estimate the constancy of weight loss (4).

c) The problem of attrition in the samples

In the event that a systematic attrition in the samples arises during the course of the study, i.e. if participants do not take part in the measurements subsequent to the intervention, this then constitutes a serious threat to the internal validity, i.e. the validity of the found effects. Pelletier reported (8) that the attrition rate in the intervention groups in several studies (in particular in the more intensive) was greater than in the comparison groups. In the case of this "differential attrition" being traced back to those intervention group participants who have not succeeded in changing their risk behaviour, the observed effect is inflated artificially when comparing the intervention and control group.

d) Self-selection

"Self-selection" is referred to as a methodical problem in nearly all examined areas of behaviour, intensely restricting the significance of the appraised studies (e.g. (2;5;7)). It is not possible in many companies to assign the employees at random to the different requirements

so that allocation is frequently on a voluntary basis. The consequence is that the people in the intervention group are possibly particularly motivated from the very beginning and increase the effects of the intervention artificially as the case may be. With regard to the field of physical activity, Dishman and others (7) point out that the voluntary participants on the other hand are frequently already involved in sports activities in other connections, which is why the intervention can really no longer be reflected as a physiological improvement – the intervention effects would be underestimated in this case.

e) Further problems

Amongst other things, other frequently mentioned methodical problems are small samples, effect measurement based on self-reporting with ambiguous validity, “regression to mean”, ambiguous randomisation concepts and the possible occurrence of Hawthorne effects.

6. Methodical approach in the reviews

All in all more than twenty survey articles were compiled during this study summarising the findings status in respect of behaviour prevention.

These reviews differ in their methodical approach in all kinds of aspects. As the reviews cited here – as already presented in item 3 – are not oriented towards the standardised Cochrane approach, they feature, to some extent, great differences in particular in respect of the methodical claim and the integration of the study results.

Different formal criteria for inclusion were applied in the survey articles in respect of the literature to be considered. Thus, for example, Pelletier (8) only expressly records those studies carried out in the USA, whilst, for example, Shepard (5) also includes studies from Israel or Japan in the analysis. Some reviews only take English studies into consideration, others also French and Spanish ones (e.g. (1)).

In addition to this, of course, various textual focal points are effective depending on their orientation as regards content, e.g. whether multi-component programmes are recorded (comp. (2;8-10)), those targeted at certain risk factors, or all programmes having an effect on the risk factors that are associated with a certain disease (comp. (1)). Even on the result variable side Pelletier (8-10), for example, only gave consideration to those comprehensive programmes that report on health and cost results, others concentrate on work-related results (e.g. absenteeism, job satisfaction, fluctuation (11)).

Yet another point of differentiation is the methodical demand made on the involved studies.

The majority of the reviews takes all study types into account right up to pre-experimental

design (thus comparison of pre-post values excluding control group) and identifies the respective methodical quality of the studies by means of an appropriate ranking as the case may be. Only a few reviews (comp. (1;7;12)) allow merely for studies including control group. Furthermore, the authors are taking a very different approach with regard to the integration of the study results. The attempt is made in very few instances to quantify the size of the effect using a meta-analytical approach (1;7;12). Instead of this, the individual studies are frequently described briefly in table form and in the end an assessment of the effectiveness provided without explicit presentation of the underlying decision criteria (e.g. (6)). Janer and colleagues (1), criticise that whilst some reviews, e.g. such as those by Glanz and others (6), classify the studies on the basis of quality criteria, the results of the studies with the better methodical design are not taken into account appropriately in their conclusion.

All survey articles have in common that they only take articles from peer-reviewed journals into consideration that guarantee a certain scientific standard due to the appraisal procedure. The metaanalysis by Bamberg and Busch (12) is the only exception recording dissertations in addition.

In the *American Journal of Health Promotion* series – up until now the most extensive literature synthesis on the effectiveness of occupational health promotion – ratings are awarded following every review that evaluate the findings status on the respective subject-matter field on a recapitulatory basis. This rating reflects the scope of the literature, the appropriateness of the applied study design, sample size and representativeness, reliability and validity of the dimensions as well as the eligibility and completeness of the data analysis for all studies in the review. The following ratings were possible:

Conclusive	Cause-effect relationship between intervention and outcome supported by substantial number of well-designed studies with randomised control groups. Nearly universal agreement by experts in the field regarding impact.
Acceptable	Cause-effect relationship supported by well-designed studies with randomised control groups. Agreement by majority of experts in the field regarding impact.
Indicative	Relationship supported by substantial number of well-designed studies, but few or no studies with randomised control groups. Majority of experts in the field believe that relationship is causal based on existing body of evidence but view as tentative due to lack of randomised studies and potential alternative explanations.
Suggestive	Multiple studies consistent with relationship, but no well-designed studies with randomised control groups. Majority of experts in the field believe causal impact is consistent with knowledge in areas but see support as limited and acknowledge plausible alternative explanations.
Weak	Research evidence supporting relationship is fragmentary, nonexperimental, and/or poorly operationalised. Majority of experts in the field believe causal impact is plausible but no more than alternative explanations.

It is to be noted that this approach can certainly be regarded critically. Fielding (13) refers to the fact being problematic that the rating is also awarded on the basis of expert opinions and

not only on the basis of the evidence at hand: Seemingly there was no systematic process for the collation and assessment of the expert opinion. Thus it remains unclear exactly who is regarded as an “expert”, how his/her appraisal was requested, whether the collected findings were available to them before the survey or whether the various rating graduations had also been understood in a uniform fashion (13).

Yet another final restriction: The reviewers (e.g. (11)) would point out that there may possibly be overrepresentation of positive effects in the reviews, as such studies are more frequently published with positive than negative effects.

7. Detailed results on areas of behaviour

The results of the reviews that can be allocated to certain areas of behaviour are presented in detail in the following. An overview of the results in table form is to be found in the addendum.

As contrary to the others, the survey article by Janer et al. (1) does not cross-reference the studies on a certain area of behaviour, instead of this compiling the evidence in respect of measures in different areas of behaviour that all serve cancer prevention, the results of this review will be broken down for better readability and allocated to the appropriate areas of behaviour.

7.1 Programmes on physical activity

a) Shepard, 1996 (5)

Nearly all the occupational sports programmes examined within the framework of the studies compiled by Shepard featured aerobics as their focal point and were offered 2 to 3 times a week for a period of 30 to 45 minutes. The participation rate was often low. It was at its greatest in studies where programme participation was a requirement for employment, massive attempts carried out in order to change the company culture, an individual advisory system introduced or if there were easy course requirements. The results in detail:

Fitness: Body Mass Index. For the most part reduction of 1 to 2% within 8 to 12 weeks (in more effective programmes to some extent also 3 to 6%). The improvements continued over 3 years. Beneficial factors: amongst other things, regular participation, intensity of the intervention, associated sticking to a diet, supervision of the activity programme, sport programme supplemented by personal advice. **Skin folds and body fat.** Regular programme par-

ticipants showed substantial changes in these parameters. The average change (without taking programme duration into account) amounted to 13%, whereby 12 studies indicated improvements of 0 to 12 % and 7 studies greater changes. Muscular strength and endurance. Improvements are also reported here within the framework of an uncontrolled study (7% grip strength growth rate over a 12 month period). Further results are reported on the improvement of aerobic power and flexibility.

All in all, the reviewed literature offers evidence that a well-structured activity programme at the place of work can improve the fitness of the participants. The BMI can be reduced by 1 to 2% (probably more if diet advice is included), body fat by 10 to 15%. Aerobic power, muscular strength and flexibility can be improved by up to 20%.

Cardiac risk factors: Global dimensions. For example, there is a report on a 35% to 45% reduction of cardiovascular risk following 3 year programme participation. The most effective intervention combined, among other things, the access to a fitness centre with personal advice and organisational changes that support activity at the place of work. Blood pressure. In the main, reports were made on reductions between 3 and 10 mm Hg in the systolic and 2 to 10 mm Hg in the diastolic values. As the changes in the most suitably controlled study were very slight even if significant (4 mm Hg systolic, 1 mm Hg diastolic), the clinical effect is possibly restricted. Cholesterol level. Many authors report on reductions in the cholesterol level of up to 15%. To some extent the changes are associated with the intensity of the intervention. Smoking. In 9 out of 10 studies the introduction of an activity programme was connected to a reduction in the number of smokers. Thus the literature appears to prove that heart circulation and other risk factors are lessened by the participation in an occupational activity programme. The ideal basic approach would appear to be the combination of an activity programme with optional modules oriented towards specific problems such as cholesterol level reduction or withdrawal from smoking.

Life satisfaction and well-being: According to Shepard (5) it is difficult to make a general statement on the effects of the activity programmes, as only studies without control groups report on improved well-being. In doing so there was little or no devolvement on the areas of job satisfaction, performance, stress or such like.

Attention is drawn to the fact that it must be taken into account in all mentioned areas that the respective statements apply to those employees taking part in the activity programme – this is normally only a small proportion of the workforce. If, on the other hand, consideration is given to businesses as a whole or the average employees, the changes would probably be far below those reported – although they could still be significant in the long term.

Medical costs: Controlled studies indicate that activity programmes can involve a reduction between \$ 100 and \$ 400 per worker year in respect of the utilisation of health care facilities. According to Shepard (5) individual reports provide information that if there is a certain minimum standard in the facilities (e.g. fitness rooms), an increase in the participation rate or improvement of the effectiveness cannot be achieved by making further investments in the equipment – instead of that the programme on offer appears to be the more critical variable. The participation rate is thus not directly proportionate to the investments in the equipment and furnishings. It would, on the other hand, appear to be a more cost-efficient strategy to enable access to middle-of-the-range facilities in connection with individual advice and an environment within the company promoting an active lifestyle.

b) Janer et al., 2002 (1)

All studies on the promotion of physical activity report on positive effects, even if only half achieve statistical significance. Significant effects were to be observed more during intervention processes offering sports facilities or sports courses rather than during programmes based on information and courses of instruction.

c) Dishman et al., 1998 (7)

Dishman and others (7) took 26 studies on the increase of physical activity into account during a metaanalytical basic approach. On the basis of the 45 effects described in these studies, the authors calculated the average force of effect of all programmes. To that effect there was an input of extremely varying effect dimensions, for example self-reports on physical activity, documentation on sport group attendance, physiological surrogates (measurement of aerobic fitness) as well as muscular strength and endurance registration. The average effect strength amounted to 0.11 with a 95% confidence interval of -0.20 to 0.40. Thus the occupational programmes achieved a small positive effect on the increase of physical activity, this not being significantly different to zero.

Although the effects reported on in the various studies were heterogeneous, this did not result in obvious moderator variables, i.e. the analysis was not ultimately able to clarify which intervention features are associated with greater success. The effects were only greater in those studies applying non-randomised quasi-experimental designs carried out at those universities exclusively applying behaviour modification techniques and in which incentives were used.

The authors of the studies acknowledge that the chosen approach of combining together the effects of studies with varying interventions and very different methods for the registration of physical activity and fitness can be criticised. The opposition of Shepard's (5) positive conclusion (comp. above) is possibly attributable to the fact that this approach does not adequately summarise the findings status. Dishman and colleagues explain that their general bottom line on the basis of the metaanalysis is not an alternative for more specific conclusions that can be gathered from major controlled experiments with uniform interventions and methods. The Johnson & Johnson study (Blair et al., 1986, cited according to (5)) is cited as an example, in which a significant improvement in fitness was, to all intents and purposes, observed.

d) Proper et al., 2002 (11)

Only controlled appraisals measuring the success of occupational programmes on physical activity in respect of work-related effects are registered in this survey article. The eight studies were assessed in respect of their methodical quality on the basis of defined criteria and each taken into consideration during the assessment of the findings status (possible assessments: strong evidence, moderate evidence, limited evidence, inconclusive evidence, no evidence).

Absenteeism. The literature viewed here is assessed to the effect that "limited evidence" is at hand for the effectiveness of occupational activity programmes on absenteeism. This means that companies could profit from this kind of programme in the sense of reduced absenteeism. At the same time the benefits are possibly greater where white-collar workers are concerned, their work featuring hardly any physical activities, than for blue-collar workers.

Job satisfaction and job stress. The evidence in respect of this effect was summarised as "inconclusive". The main reason for this are the inconsistent results that the authors mainly attribute to differences in the definition and the registration of the effects or the compliance.

Productivity. Different results were found here depending on whether the studies register the increase in productivity on the basis of subjective or objective dimensions: Whilst the employees see themselves as being more productive, this is not however reflected in the objective key data. A possible explanation for this could be that the test persons in the studies on objective registration were mainly industrial workers, whose productivity is determined by machinery cycles and that remains unchangeable in spite of their own feeling of increased efficiency.

Fluctuation. Only one controlled study was available on this indicating reduced fluctuation. Due to the lack of further randomised studies the evidence in this case is assessed by the authors as being "inconclusive".

7.2 Programmes on nutrition and cholesterol level

a) Glanz et al., 1996 (6)

Nutrition: Virtually all non-randomised studies showed positive results in respect of nutrition knowledge, behaviour or buying patterns. In all, the studies with randomised groups also reported positive results, however in doing so, the effects varied considerably. In general, the registration of nutrition by means of self-reports is problematic and is subject to different possibilities of distortion. Registration based on food purchased in the cafeteria is a further possibility, however this in turn only examines eating behaviour at work itself.

Overall, Glanz et al. cautiously suggest that group instruction courses, in particular in combination with individual advice, bring about some changes in the attitude towards nutrition. Canteen-based programmes (for example appropriate pricing for healthy/less healthy food) hold promise that buying behaviour within the canteen is changing.

Cholesterol: All non-randomised studies report on positive eating behaviour effects and/or a reduction in the cholesterol level. On the other hand, the results of the studies using randomisation were less consistent; some of the changes were minor or insignificant trends, short-term reductions or possible artefacts of selective attrition.

Strategies that included individual advice (particularly if these were aided by frequent subsequent activities or additional materials) showed a consistent short-term improvement in eating behaviour and/or cholesterol level. The majority of studies involving group programmes also showed positive results, even if the significance here is lower on account of the aborting party rates and lack of randomisation. At large, the results provide evidence that seemingly more intensive strategies and those strategies combining academic and environment-related basic approaches achieve greater effects.

On account of the restrictions regarding the design of the studies carried out in this field, the evidence is classified at large by the authors as being between "indicative" and "suggestive". It seems clear that occupational nutrition and cholesterol programmes can be carried out and that the participants profit from these short-term. The causal correlation however is not sufficiently substantiated.

b) Janer et al., 2002 (1)

Nutrition. Positive, yet moderate effects arise here. All 14 studies observe changes in the expected direction, at least in respect of some of the watched variables, and of these eleven achieved statistical significance.

Studies on the increase in the consumption of vegetables report on an increase of 0.09 to 0.19 consumed portions daily. The changes in respect of fruit are between 0.11 to 0.24 portions daily. In studies combining the consumption of fruit and vegetables, changes of 0.18 to 0.5 portions are reported. Changes in fat consumption were significant in 6 of 10 studies, resulting in reductions in the share of calories arising from fat as measured by 1000 calories of up to 3%. Only one study indicated a rise of 1.3%. A rise in consumed dietary fibres was shown in 3 out of 5 studies, this being up to 1.7g per 1000 calories.

Interventions including additional changes in environmental conditions, (e.g. canteen offers) show similar effects to those stated above. Likewise, no greater effects were connected with the employee participation in planning and implementation.

The percentage of the change maintained after 6 to 12 months varied between 30% and 65%.

7.3 Programmes on weight control

a) Hennrikus and Jeffery, 1996 (4)

As a median 39% of all overweight employees could be recruited for participation in the programmes. There are indications that the programme **participation rate** was greater if a wellness consultant contacted all overweight employees personally and invited them to participate in the programme, if the employees were able to select their own components from a menu, if the employees were not required to pay a participation fee and if direct rewards were issued for participation such as T-shirts or cups.

The **attrition rates** fluctuated considerably (<1% to 68%) with a median of 25%. Study comparison indicated that the attrition rates are lower for those programmes including participation incentives (median 20%) or competitions (median 3.5%). Furthermore, frequent meetings, active calling on participants failing to attend as well as charging a fee for participation are possibly connected with a lower aborting party rate.

Short-term weight loss. The results of randomised controlled studies indicate that occupational weight control programmes can bring about moderate short-term weight losses of 1 to

2 pounds for the participants. On that score, this evidence is assessed by the authors as "indicative". In doing so, the majority of the programmes are explicitly oriented towards achieving this kind of moderate (in contrast to a very large) weight loss. Some studies report that programmes including behaviour modification components are more effective than programmes without these components.

Long-term weight loss maintenance. Cross-study, the extent to which the participants were able to maintain their weight once the programme had finished varied greatly. The median after 6 months was 54% (between 0% and 80%) and 26% after 12 months (likewise between 0% and 80%). It is thus apparent – similar to clinic programmes – that an increase in weight is customary after the programme has finished.

b) Janer et al., 2002 (1)

Weight control. The results in respect of weight reduction vary between the different studies from an increase of 0.25 kg right up to a weight loss of 3.5 kg. The short-term effects of the programmes taken into account were greater than the long-term effects after 2 to 3 years.

7.4 Programmes for smokers

a) Eriksen and Gottlieb, 1998 (14)

Smoking cessation programmes. Studies on smoking cessation groups showed that between 0% and 91% (median 23%) of the participants stopped smoking successfully ("abstinence rate"); the period of time under observation was between 6 and 24 months. Those studies applying a stricter method, including a comparison with a control group, showed net differences of 3% to 25% between the intervention and control group. Minimum interventions simply included self-help material, a telephone helpline or short videos for example. The overall abstinence rate median here was at around 10.1%. Controlled studies using minimum video intervention showed net differences to control groups of -0,5% to 14% (median 0.5%). Group systems are thus apparently more effective than minimum intervention. Evidently both the participation rates and abstinence rates can be increased as against the normal group programmes by integrating competitive elements; the cited studies indicated abstinence rate net growth of 1%, 4% and 25%, whereas it is less evident in respect of the use of incentive systems whether this can improve the participation or abstinence rates. The literature at large is referred to as "suggestive" to "indicative".

Smoking policies. The findings are consistent in such a way that appropriate regulations on smoking bring about a reduction in cigarette consumption at the workplace, a middle entry of 3.4 cigarettes per day. Other studies report that 12% to 39% of smokers stated that they smoked less or not at all at work. The findings in respect of an overall change in cigarette consumption, thus also at home, and in respect of the prevalence of smoking, are less clear-cut. What is more, lower nicotine and cotinine values were displayed in companies with a ban on smoking than in those companies permitting restricted smoking or without any restrictions. Although the literature at hand is described as “weak” on account of the lack of quasi or experimental design, the findings in respect of the positive effects of these occupational regulations are very consistent in respect of cigarette consumption at work and the exposure to tobacco smoke at the workplace and somewhat less consistent in respect of overall consumption. They were not consistent when it came to prevalence.

b) Janer et al., 2002 (1)

Smoking cessation programmes. The percentage rate of those persons in the intervention groups, who succeeded in giving up smoking, was between 10 and 15%. If one took the parallel changes in the control groups into account, there was a net difference of around 5-6% in favour of the intervention groups. In the majority of studies the effects observed at the end of the intervention attenuated in the course of time. The effect had reduced by around 40% to 80% six months after the end of the programme. To some extent this can be due to more extensive latency in the control groups where the participants frequently received self-help material. It appears as though the reduction, at hand in the intervention groups after 6 months, holds steady over the total period of time.

According to Janer et al. (1) the effectiveness of the programmes increases by up to 6 months following longer intervention duration, but after this there do not appear to be any additional effects. The intensity of the intervention (number of contacts) appears to be weakly linked to the abstinence rate: Although the highest abstinence rates were observed in intensive programmes, high intensity does not always lead to more successful intervention.

Studies comparing interventions with and without incentives, reported in the main (4 out of 5) on greater abstinence rates in the incentive groups. The effect of the incentives was, however, reduced considerably on a long-term basis in one of the studies, whereas there was even a negative incentive effect on the long-term abstinence rate in another study. One study showed that incentives only achieve effects in a sub-group of employees boasting a lesser level of education.

Social encouragement (e.g. being asked by co-workers not to smoke), was linked to a higher abstinence rate. Supplementary changes in the working environment (e.g. setting-up of non-smoking areas) only had additional effects to some extent. Withdrawal programmes for smokers appear to be more effective for managers, moderate smokers (<1 packet or <10 cigarettes per day) and smokers who have already tried to stop smoking in the past or who have not smoked for so long.

7.5 Programmes on alcohol

a) Roman & Blum, 1995 (15)

According to Roman und Blum (15) several aspects are to be taken into account with regard to interventions in connection with alcohol, in which this area of behaviour differs from the others looked at here.

Thus in addition to the costs of utilisation of the health system and incapacity for work due to the consumption of alcohol or a problematic attitude towards drinking by employees that are also linked to other areas of behaviour, there are additional losses due to a lesser degree of performance, an increase in the proportion of rejects due to defects and accidents as well as social costs within the framework of interaction between employees handicapped by alcohol and their colleagues, customers and contractors. In contrast to smoking however, the objective here is not complete abstinence, but rather more minimised consumption. Furthermore, the interventions frequently have a different starting point to the other areas of behaviour: On account of the importance of the "significant others" during the consumption of alcohol, these alcohol prevention training courses often take up just here (e.g. superiors) and thus have not the drinking pattern of the course participants but that of others as their focus, which in turn makes evaluation difficult.

Unlike Germany, strict occupational regulations have been in force nearly everywhere in the USA for decades prohibiting the consumption of alcohol during working hours and mainly also for the period of time directly before working hours begin. Inasmuch, an evaluation of the regulations there is not possible and is also not included in the review referred to here. Roman and Blum differentiate between the following intervention formats: 1) occupational programmes approaching employees with an alcohol problem directly, mainly in the form of a so-called "Employee Assistance Program" (EAP) and 2) Training courses for superiors on the subject of alcohol, which frequently provide information on implementing EAPs. Overall, the evidence on the effectiveness of the interventions is described as "suggestive". The fol-

lowing results were observed and summarised: Changes in attitudes and knowledge of alcohol problems; change in the willingness of persons with alcohol problems to obtain medical support; reduction with regard to the amount of alcohol consumed or with regard to an unhealthy attitude towards drinking; changes in working behaviour, e.g. improved performance and less absenteeism, attributed to the regained control over drinking and/or changes in attitude towards drinking that reduce the interference with role behaviour. For the most part, subsequent surveys were carried out shortly after intervention so that statements can hardly be made with regard to the long-term effects. Programmes with a focus on the employees or superiors should complement each another and not be mutually exclusive.

7.6 Stress management programmes

a) Bamberg and Busch, 1996 (12)

The assessed interventions involve cognitive-behavioural training courses, namely Meichenbaum's stress immunisation training, multi-component stress management training and stress management workshops.

At **individual level** the overall effect size was at around $d=.41$ (d = population effect size estimator weighted on sample size). Effect size is greatest for mental/somatic symptoms ($d=.42$), and lowest for psycho-physiological stress symptoms ($d=.15$, n.s.). Coping/control cognition ($d=.24$) and health/leisure behaviour (d not calculated) were registered in addition to this. At **organisation level** absence, intention to quit, performance and costs of accident/insurance were registered as effect variables. Effect size amounts to $d=.22$ (n.s.) at this level, showing that the effects are much lower here. The effects on the "**individual – organisation**" interface (anxiety/stress at workplace, burnout, job satisfaction, social support) were at around .27.

There was no indication of specific effects of individual training processes. At large, special consideration of the job activity within the framework of the training course did not emanate from the description of the studies. The authors assessed that "occupational" stress management training thus merely seems to be characterised by the fact that it is carried out in the respective company involving gainfully employed persons.

b) Murphy, 1996 (16)

Stress management intervention measures are described here as techniques and programmes intended to help the employees in changing their appraisal of stressful situations and/or handling stress symptoms in a more effective manner. The studies registered in the review apply various techniques (muscle relaxation PMR - 20%, cognitive-behavioural methods - 20%, meditation - 9%, Bio-feedback - 6%, combination of PMR with one of the listed methods - 47%, other methods - 27%). Furthermore, various result variables are registered (physiological/biochemical, psychological/cognitive, somatic complaints, job satisfaction, healthcare costs and time spent at clinics, absenteeism). The various techniques apparently have a different effect on the respective varying result variables.

Muscle relaxation. It would appear that muscle relaxation has a particular impact on physiological aspects (e.g. blood pressure, muscle activity) – commensurate with the focus on the somatic symptoms of stress.

Meditation. As meditation was merely analysed in 6 studies, it is only possible to draw cautious conclusions in this respect. It is, however, noticeable that there were significant effects on all result variables; at the same time, meditation techniques are inexpensive and easy to learn. They are, however, – presumably on account of their association with eastern religions – scarcely widespread in workplace health promotion.

Bio-feedback. This intervention was the least applied and its effectiveness not substantiated with regard to most result variables. The high financial and personnel involvement also speaks against the use of bio-feedback in an occupational setting.

Cognitive-behavioural training. Commensurate with the focus on the change in cognitive processes, this technique showed the most consistent effects on psychological variables, in particular anxiety. Furthermore, training seemed to have positive effects on job satisfaction – this, however, was rather more to be seen in non-controlled studies.

Combination of techniques. The most frequent combination of techniques consisted of muscle relaxation and cognitive-behavioural training, thus including a main focus both on the mental and somatic aspects. In comparison with all other implemented interventions, this proved to be the most effective: The combination showed positive effects on all result variables.

Overall, Murphy (16) summed up that muscle relaxation appeared to be the most effective in respect of physiological variables, whilst on the other hand cognitive-behavioural approaches were most effective for psychological symptoms. A combination of stress management techniques appears to have the best effect on somatic complaints. The evidence is assessed as

“indicative“ in large and as “acceptable“ when only taking a combination of muscle relaxation and cognitive-behavioural technique into account.

A recommendation is that stress management interventions should be more comprehensive in their orientation and must also take prevailing working environment stress factors into account in order to create significant effects on organisational variables. The relaying of stress management abilities only deals with a part of the problem; ideally, comprehensive interventions should be applied both to individual and organisational factors.

7.7 Back training

a) Nentwig, 1999 (17)

Back training is defined by Nentwig as training programmes for spinal column-friendly motion sequences and posture aimed at preventing degenerative spinal column diseases. In the meantime, back training has been carried out for 30 years, whereby very different respective aims are followed: These range from primary prevention to secondary prevention in the case of acute or subacute back complaints and tertiary prevention in the case of chronic pain. The clientele is often varied during occupational back training, including participants both with and without experience in respect of back pains.

In order to be able to assess the effectiveness of back training, the author consulted the conclusions come to in various accumulative reports, metaanalyses and commissions of experts on account of the incalculable abundance of individual studies. In doing so, three of the five accumulative reports come to a positive assessment, at least for sub-areas, namely and among other things for workplace implementation. Both metaanalyses that were consulted provide clear evidence of the effect of back training according to Nentwig’s appraisal, however with a clear restriction on impact duration. Of the five commissions arguing for the effectiveness of back training, three recommend the implementation of back training at the workplace or for acute complaints. Nentwig summarises that the findings, appraisals and recommendations at hand are heterogeneous and, to some extent, contradictory. Against this backdrop he comes to the conclusion that the effectiveness of back training is most rapidly safeguarded by in-house programmes within close workplace vicinity and programmes that incorporate intensive training. The intensity increases with the duration of the training course as well as with the application of didactic measures on behavioural changes and stabilisation.

**b) Council of experts for the concerted action in the healthcare sector: Survey
2000/2001 (18)**

Within the framework of the survey on the care requirement equity, the council of experts is involved, among other things, with back pain affliction and the basic approaches of occupational health promotion in this respect. In this connection and in respect of the effectiveness of back training based on a health technology assessment report and current literature, it is determined in summary that “primarily preventive back training is ineffective as an individual measure with or without respect to the workplace” (page 132). In contrast, there is a sufficient amount of safe information that back training oriented towards secondary and tertiary prevention can be effective and have a cost-lowering impact if the access and orientation of programmes on offer are strictly centred on target groups and the circle of participants selected carefully.

Thus concerning the question of the effectiveness of back training at the workplace, the council of experts evidently arrives at a greater restriction than Nentwig (17). At large, the evidence appears to be relatively diffuse regarding the effectiveness of primarily preventive back training.

In addition, the council points out that within the framework of occupational prevention, behaviour-related measures such as lifting training and back training only have a function complementary to working condition improvements to achieve optimum adaptation of the workplace environment to the user, but would probably remain largely ineffective as an exclusive measure.

7.8 Multi-component programmes**a) Heaney & Goetzel, 1997 (2)**

On account of the reviewed studies the authors are able to determine that the provision of a comprehensive health promotion programme incl. educational aspects, relaying of skills and changes in the environmental conditions is not necessarily adequate in order to create positive effects: 67% of the studies with these components feature “encouraging”, 25% mixed and 8% disheartening results. On the other hand, programmes including the opportunity of individual (behaviour) advice for those employees having a high health risk appear to promise more success (of these 80% reported “encouraging” results). In addition to this there is

information that the offer of a “menu“ consisting of different strategies on risk reduction, which the employees are able to choose from, improves the results.

The reported effects must be seen against the backdrop that there, apparently, is a connection between the design of the studies and the results: Whilst the pre-experimental (i.e. carried out without control group) studies feature 100% encouraging results, this proportion is at around 22% for the experimental studies (i.e. those with randomised control group). Of these, 56% feature mixed effects.

Various studies feature the trend of the effects disappearing again after a certain period of time. It therefore appears to be of particular significance to direct attention towards the maintenance of the change in behaviour over time and develop strategies in order to give the employees active help in avoiding relapses. Ideally, the programmes should be management-supported so that they become an integral part of the company culture.

At large, approx. 2/3 of the reviewed studies confirm the effectiveness of comprehensive programmes on occupational health promotion with regard to the reduction of the employee health risk. On account of the great variation in the methodical quality and the inconsistent results in the methodically most demanding studies, the evidence at large is assessed by the authors as “indicative/acceptable“.

b) Pelletier, 1996, 1999, 2001 (8-10)

In his series of reviews, Pelletier restricts himself to the compilation of those studies reporting both on the health and cost results of comprehensive occupational health promotion programmes.

In doing so he comes to the conclusion that a) the predominant part of the research indicates reasonable clinical and cost-related results, b) more recent studies boasting stricter methods tend more to substantiate the results of earlier and less demanding studies rather than refute them and c) the methodical weaknesses and the multifariousness should not be assessed negatively from the outset. On the contrary, the latter would show that the relationships could be observed in many different companies with the widest range of employee groups, types of interventions and a varying degree of methodical stringency.

Overall, according to Pelletier (9) the evidence indicates that multi-factorial health promotion programmes focussing on multiple risk factors, reduce the risk of chronic diseases for the employees.

8. Results on the financial consequences

One mainly distinguishes between the costs caused by (sickness-related) absenteeism and the medical costs of the employees when it comes to the question of the financial effects of workplace health promotion.

a) Absenteeism

Of the 14 evaluation studies on various health promotion programmes examining absenteeism as a result variable and summarised by Aldana (19), all report that the measures brought about a reduction in absenteeism. Within the framework of quasi-experimental studies reductions in absences from work of 12% to 36% arose for the participants in health promotion programmes or a reduction of 34% in the costs associated with absences from work. One uncontrolled study even reports a 68% reduction in absenteeism amongst programme participants.

In addition to this, three of the studies established the cost-benefit ratio and return of investment; these are at around 1:2.5 or 1:4.85 in quasi-experimental studies and at 1:10.1 within the framework of a correlation study. This means that for every dollar spent on the programme 2.5 \$ for example were saved in the former study due to reduced absenteeism costs.

Chapman (20) also summarises the results of his literature survey on 42 studies on the economical effects of occupational health promotion programmes to the effect that strong evidence is at hand for the reduction of absences from work.

Golaszewski (21) also comes to the conclusion that, in the meantime, the positive effects of health promotion programmes on absences from work are adequately supported. The author even identifies the reduction of absenteeism as the most powerful health promotion argument.

b) Medical costs

In respect of the direct medical costs, 32 studies are registered by Aldana (19) on an evaluative basis. Only four studies (none of randomised design) do not report on a connection between medical costs and programme participation. In contrast, the results of the other studies are remarkably consistent in the sense that health promotion measures are evidently associated with lower health expenditure: The authors of the methodologically more demanding studies attribute this to the causal impact of participation in health promotion programmes. Observed effects are, among other things, fewer visits to the doctor, less hospitalisation as

well as less days spent in hospital etc. The results of the review by Chapman (20) point in the same direction, reporting on an average reduction in medical costs of 26.1%.

According to Aldana (19) the so-called “return of investment” (ROI) in respect of the reduction of medical costs is between 1:2.3 and 1:5.9 – this value is all the more impressive because it is to be found in a study controlled at random.

On account of the average study duration of 3.25 years it remains unexplained as to how long these benefits continue and whether they become greater or smaller by and by. The reduction of certain health risks probably does not result in a decrease in medical costs for many years. As, in addition to this, the study participants were 39 years of age on average and cardiovascular disease, for example, normally only arises at the age of 40 or 50, the reduction of health risks probably only has an impact on a reduction of the actual diseases several years later. Insofar, the exhaustive financial effects of the health promotion programmes possibly only crop up many years after the health risks have been reduced – which makes the observed short-term effects even more remarkable.

Pelletier (8-10) lists further positive results in respect of the reduction in absenteeism and lowering of medical costs from a multitude of studies. He also arrives at the result that occupational health promotion brings about both positive health and operational effects. In this connection Pelletier (10) points out that it is decisively important for the cost effectiveness of health promotion programmes to reach especially those employees with high health risks. He says that a reason for this is the distribution of the medical costs, which displays a legally inconsistent form and does not follow the normal distribution path, i.e. a small proportion of the employees causes the greatest proportion of costs. Thus according to his comments, the potential for the greatest cost saving is to be found in a small number of high-risk employees. On the other hand, however, there is the basic public health approach that although aiming at a lower risk reduction rate, is directed towards more people.

Altogether, Aldana (19) summarises the literature on the financial “impact“ of health promotion as “indicative“. After considering the “shining lights“ of health promotion, Golaszewski (21) also sums up that these pay off – most notably due to the reduction in absenteeism and the decrease in medical costs.

9. Concluding summary of the findings on the effectiveness of behaviour-preventive occupational health promotion

On the basis of the presented results and for the purposes of a conclusion it is now possible to answer the following crucial questions regarding the effectiveness of behaviour prevention within the framework of workplace health promotion:

Can behaviour-preventive occupational health promotion measures...

✓ ... help to reduce health risks?

The available findings support the effectiveness of occupational health promotion programmes with regard to the reduction of health risks, whereby the evidence is more well-defined in some areas than in others (also comp. (22)).

For example, controlled studies provide quite convincing evidence of the effectiveness in the attitude towards smoking. It is here that occupational programmes actually prove to be more effective than community based programmes. Company intervention courses are also successful in the area of (short-term) weight control, namely to a degree comparable to programmes offered by clinics. Measures aimed at changing the attitude towards nutrition and lowering the cholesterol level appear to be promising but inadequately substantiated. Programmes on increasing physical activity appear to improve the fitness of the participants (even if to a lesser degree).

The question whether company health promotion measures lead to a reduction of health risks amongst the participants can thus be answered with a “yes“. The restriction “amongst the participants“ is to be taken into account here. This means that, as a rule, the effectiveness of the measures has been measured by taking those people into account, who participated in the programme and not on the overall company level. Insofar, one must assume that the effects, for example, of sports or nutrition programmes in respect of the “average“ employee are considerably lower than the published figures suggest, as the study participants normally represent a small, health-conscious minority (5). Thus, it cannot be clarified on the basis of the data up until now, whether a health risk reduction is actually achieved in respect of the entire company carrying out this kind of programme on health promotion. Insofar, the following aspects are important in connection with this question and are taken up again below: A high participation rate is the primary prerequisite in order to achieve a relevant comprehensive company effect. The question concerning who participates in the programmes is closely associated with this; in order to achieve a positive effect on the health risks of all employees,

it is, of course, vital that not only those persons participate, who previously were already nutrition-conscious, sporty etc.

✓ **... help to reduce medical costs?**

A range of studies was able to show that short-term (within 3 to 4 years) occupational health promotion measures bring about a reduction in medical costs; long-term this effect is possibly even greater.

✓ **... help to reduce absenteeism?**

It is demonstrable that programmes on occupational health promotion lead to a reduction in absenteeism.

Does occupational health promotion pay off from the point of view of the company?

At large findings indicate that occupational health promotion pays off, particularly due to the reduction of medical costs and reduced absenteeism. The reported "return of investment" values are between 1:2.3 for the saving with regard to medical costs and 1:10.1 in respect of the saving of costs due to a decrease in absenteeism.

10. Approach to date on occupational health promotion:

Criticism and problems

In order to improve the effectiveness of workplace health promotion even further, it is necessary to initially look into the criticism of the methods of approach up until now.

a) Utilisation of the occupational environment

Elementary criticism is that the possibilities for increasing the effectiveness of the programmes offered by the occupational setting, are only exploited in the minority of cases (4;23). Within the framework of interventions on nutrition alteration, very great clinically oriented basic approaches were used with voluntary employees or those at high risk. The training courses carried out during many of these occupational studies are very similar to those originally designed and developed for a clinical setting and that were now simply transferred to an operational environment. The only difference in these studies was in the setting in which the intervention took place or from which the participants were recruited (23). In this way, for example, the possibility was not utilised of carrying out the programmes for an extensive period of time in order to possibly achieve long-term success (4).

b) Integration of other spheres

Health promotion activities separate work from other spheres of life in an artificial fashion (3). Thus, for example, women suffer from an increase in stress on account of the different role requirements, including caring for children and older relatives. In order to facilitate the daily health-beneficial activities for them, changes in working conditions and family support services would be necessary (Dean, 1992, cited according to (3)) – aspects that are not taken into account in most of the occupational health promotion programmes.

c) Programme duration

All in all, the programmes that are carried out are relatively short and do not take the problem of permanent maintenance of the changes into account to an adequate degree (3). Only a small proportion of the interventions (mainly in the field of physical activity and nutrition) include a long-term perspective, e.g. by applying enhancement or strategies on relapse prevention over a longer period of time. To that effect most of the success reports are based on the demonstration of short-term behaviour changes (up to one year after end of programme; comp. (22)).

d) Participation

One of the greatest problems of workplace health promotion appears to be the low participation ((1); see above). In North America the success of activity programmes has been challenged since appraisals indicated that, at best, only 20 to 30% of the entitled employees participate (7). This is especially problematic against the backdrop of self-selection as it must be assumed that it has not been possible to reach exactly those employees, who would profit the most from behavioural changes (3). Thus there is information (Heaney & Inghish, 1995, cited according to (24)) that employees boasting a high health risk, such as smokers, persons with high blood pressure or cholesterol level or those with a sedentary lifestyle, are probably less likely to participate in health promotion programmes.

11. Recommendations

Over and above as well as on the basis of the identified problems, recommendations can be expressed that should be taken into account during the planning and execution of workplace health promotion programmes.

a) Comprehensive programmes

As already mentioned, programmes on workplace health promotion can be applied to varying degrees. "Comprehensive" programmes comply with the current stage of development (22). Pelletier (8) also comes to the conclusion that, in respect of their effectiveness, these out-match those programmes simply aimed at an individual risk factor.

At the same time, a narrower definition of the term "comprehensive" is used for those measures that also integrate the respective environment of the company (families of the employees, community and customers) as well as organisational changes (22). In yet another definition Pelletier (9) describes those programmes as "comprehensive" "that provide an ongoing, integrated program of health promotion and disease prevention that integrates the particular components [i.e. smoking cessation, stress management, lipid reduction etc.] into a coherent, ongoing program that is consistent with corporate objectives and includes program evaluation" (page 333) and uses this term on an interchangeable basis with "multicomponent".

Better effectiveness is justified in that employees showing risk behaviour normally show this in several areas of behaviour and not just in one (e.g. smoking, fatty nutrition and little movement; Emmons et al., 1994, cited according to (2)). Programmes of multi-factor design have a greater chance of enticing those high-risk employees to participate. The employees can then choose which risk factor they wish to work on first. If they manage this successfully, they are possibly more motivated and confident of being able to change other areas of behaviour ((2), also comp. (14) on attitude towards smoking). In addition to this, multi-component programmes offer the possibility of various employees being able to profit in different ways from the same programme, depending on the which risk factor they are concentrating on (9).

Janer and colleagues (1) also concede that this basic approach has intuitional plausibility, but at the same time point out that up until now the better effectiveness of comprehensive programmes has not been substantiated by a direct comparison with those programmes involved with just one risk factor.

b) Individual advice to high-risk employees

Some authors (e.g. (2;8)) see the decisive aspect for the effectiveness of comprehensive occupational health promotion programmes in individual advice to those employees exhibiting a particularly high health risk. Heaney and Goetzel (2) thus indicated that of the programmes with advice components, 80% featured encouraging effects, and the others on the other hand only 45%. Interventions restricting themselves to informing the employees in general are relatively inexpensive, do not, however, appear to be as effective as the more

intensive and expensive basic approaches that also include permanent, regular individual advice and support. According to Pelletier (8;9) they are a necessary yet inadequate prerequisite for long-lasting risk reduction amongst those employees exhibiting a high health risk. Once a supportive operational environment has been created, he therefore recommends introducing subsequent intervention oriented towards the identified individual risks and guaranteeing permanent behaviour changes and medical supervision as defined by “disease management“ intervention.

It must, however, be remarked that from the point of view of a public health basic approach, this approach would presumably not be favoured and that measures would be recommended instead of this, which although less intensive, have a greater reach and bring about small, yet significant effects for a greater number of people (6), involving lower costs per employee.

c) Strategies on an increase in participation

Low participation is one of the main problems of health promotion (see above) and there are very few empirical records available as to which factors are in connection with greater participation and lower attrition rates (1). According to Janer and others (1) a participatory approach for the purposes of integrating the employees in the preparation and execution of the measures is the only clue on the face of the current findings.

There is further information from the weight control area that, for example, the use of incentives for attendance and group competitions can reduce the attrition rates noticeably. Other beneficial components appear to be frequent meetings, actively calling on those participants missing meetings and imposing a fee for participation (4). The results of a study by Erfurt and Holtyn (1991, cited according to (9)), are contradictory to the final aspect that the participation rates are reduced considerably if one expects the employees to pay for the programmes. It is possible that the imposition of a fee has an impact in the sense that where in fact fewer people decide to participate, of these less abort the programme during the further course.

d) Strategies on an increase in effectiveness

Based on positive relationships found in studies on smoking cessation, it is suggested to have repeated contact with participants and to extend the duration of the intervention (at least 6 months) in order to increase effectiveness (1). According to Pelletier (8) an intervention must be maintained for at least 3 to 6 months in order to bring about a reduction of the health risk for the employees and 3 to 5 years in order to demonstrate cost effectiveness. Some results indicate that continuous support and the use of incentives increase the effectiveness of interventions. The positive effects of incentives, however, cannot be demon-

strated long-term. In one study on the behaviour area of smoking they even appeared to have negative effects (1).

The findings consistently point at greater effects for those studies implementing tailor-made interventions, i.e. that oriented the messages towards the respective individual employee characteristic traits. This was mostly in the style of the “stages of change” model (1).

Janer and others (1) point out that those interventions in the nutrition area including changes in the environmental conditions (e.g. canteen or vending machines), have not proved to be more effective than programmes excluding these components.

Ideally, according to Pelletier (9), occupational health promotion programmes should be supported by senior management, so that they become an integral part of the organisation culture. The employees must naturally also be accorded the flexibility to participate in these measures.

e) Utilisation of the occupational setting

Utilisation of the occupational setting seems to be a decisive aspect for the design: As shown by the results regarding incentives and competitions, more emphasis on the company as a social unit leads to more effective new interventions, that do not just represent a transfer of clinical techniques to an occupational setting (2). Thus, for example, the communication channels within companies could be used in a creative fashion for training courses and promoting motivation instead of the traditional courses.

f) Theory-accompanied approach

Health management programmes up until now are characterised by the fact that they are not accompanied by theory in the majority of cases, i.e. they were designed without relating to socio-scientific models on behaviour change (2;7). Thus, for example, it is naive to expect adults to give up a lifelong habit such as smoking simply because they are provided with a brochure looking at the dangers and consequences of smoking. In contrast, the application of validated behaviour change models appears to be a promising possibility of increasing the effectiveness of the measures (2). This is substantiated by the findings provided by Janer et al. (1) that interventions on the basis of the stages-of-change model were associated with improved effects.

12. Forecast: Results on the field of prevention by adapting the working environment

In the German-speaking area the term “Verhältnisprävention“ (literally translated “conditions prevention”) is not only used for measures referring to the ergonomic design of the working environment and work equipment, but also to appropriate work contents and work organisation and with the help of which health hazards are to be abolished.

The scope of prevention by adapting the working environment or of what is understood by this, is thus very large and includes a notably wide spectrum of measures. It thus encompasses ergonomic workplace changes, for example acquisition of office chairs that are adjustable in height, changing the room lighting or also the improvement of the canteen food. In addition to this, however, it can also include far-reaching organisational changes. In turn, for example, and in the wider sense health circles, job rotation, job enrichment, etc. belong to this field. It appears to be difficult to draw a borderline, e.g. to all intents and purposes, it is also possible to understand measures such as the introduction of group work or changes in the shift system as measures for prevention, if they demonstrate positive health effects – even if this was maybe not the actual main aim of the implemented change. If, however, one understands optimum individual adaptation of the workplace environment to the user as such a wide definition – and every closer restriction would be at random - then it becomes downright difficult to assess the evidence in respect of the effectiveness.

One difficulty here is to identify all relevant sources. Several aspects play a part in this connection: There is not a term in the English literature that classifies the relevant studies in compliance with the word “Verhältnisprävention“ as a generic term, thus facilitating the search. At the same time, however, many of the measures (e.g. configuration of working hours), are, in any event, also probably not looked upon and handled by the actors as belonging to this generic term. In addition to this, very many different research directions (e.g. physicians, engineers, social scientists, ergonomists) make their contribution in this field, but whose efforts are, understandably, not published in a standardised organ as in the area of behaviour prevention.

At large and due to the literature research in this field up to now, it has become clear that one needs to render very much more extensive preparatory work for a well-founded evaluation; this includes prior determination of the measures in the occupational environment that can have positive effects on the health of the employees and that should be registered in this sense as prevention by adapting the working environment.

It was, at this point in time, therefore necessary as far as the project to hand is concerned and on account of personnel resources, to do without registering the available literature to such a degree that could only roughly be referred to as “complete”.

In addition to many individual studies and within the framework of the conducted literature search, only one review could be identified by Westgaard and Winkel (25), in which 92 studies were summarised on various areas of prevention by adapting the working environment. Here, the focus of the authors was on interventions with effects regarding an improvement in musculoskeletal health. The results are described below.

The first result of this review is that the studies at hand feature serious methodical faults. None of the 92 studies reached the methodic standard originally demanded by the authors as an inclusion criterion (appropriate statistical appraisal, group size, ability to generalise, reliability and validity of the variables, control group, reasonable subsequent survey period and documentation).

Studies on mechanical expositions.

a) Interventions on external mechanical exposition (workplace design). In the studies involved, objects such as chairs, tables, monitors were purchased in order to diminish mechanical stress or the workplace (e.g. sewing workstations) improved ergonomically in another manner. The studies are summarised to the effect that a reduction in mechanical exposition can have a favourable impact on the musculoskeletal condition if this exposition is high initially as for example for industrial workplaces. The results on workplaces involving little mechanical stress, e.g. workstations, go in the same direction if the findings here are also less distinct.

b) Ergonomic programmes (multiple intervention measures). This summarises those studies implementing several ergonomic interventions at the same time, for example workplace improvement and ergonomic training. Though the reported results are positive, they cannot safely be traced back to the respective interventions on account of the lack of control groups.

Studies on changes to the production system.

a) Rationalisation strategies. Seven interventions including rationalisation strategies were registered here, as these declared their objective as wanting to improve musculoskeletal health in addition to increasing productivity. On account of inadequate study design, it is, however, hardly possible to make a statement here. Up until now, these studies at least offer little information on improvements in health being achieved due to rationalisation strategies.

b) Organisational culture. The interventions registered on this differ among each other in manifold respects, e.g. with regard to the size of the study group (from less than one hundred

to many thousands), duration (a few months up until 13 years) and basic intervention approach. The interventions are often initiated by company management and materialise due to combined efforts by company management and the healthcare sector. So-called “Safety Health Environment Management“ systems are frequently applied to identify problems, to analyse and to implement solutions (e.g. workplace design, job enlargement). Other studies emphasise the participatory basic approach with team building and quality circles and include the employees in the finding and implementation of solutions. The most frequently described intervention is the establishment of an “ergonomic team“, which comes close to the health circles, which are widespread in Germany: Groups with management representatives, occupational safety and health experts and employees. Predominantly positive results are reported in the controlled studies. In doing so, it appears that the successful interventions differ from the less successful ones to the extent in which they are supported by the company, and in particular by company management.

Beyond this, Westgaard and Winkel cross-reference interventions in the field of behaviour prevention with effects on musculoskeletal health, but which will not be looked at in detail at this point.

At large their appraisal is that in addition to behaviour-preventive interventions, those measures calling on organisational culture are particularly effective. At the same time, preferably multiple interventions are to be applied in order to reduce identified risk factors. As a higher-level strategy it is, according to this, necessary to identify individual risk factors and deal with these. The authors, on the other hand, rate those concepts as not being very promising that have a very general approach on account of the hypothetical knowledge concerning mechanisms during the development of musculoskeletal symptoms (e.g. exposition above a certain borderline). As a reason for this they point out that the understanding of the mechanisms involving musculoskeletal diseases is very limited and that these are mostly of multi-causal origin.

Westgaard and Winkel attribute the results regarding the mechanical exposition not being non-ambiguous to the fact that these interventions are frequently one-dimensional in the sense that only a certain stress aspect is taken into account. But for all that, interventions taking up mechanical expositions are an important integral part of organisational interventions (for example, subjects of this kind are processed within the framework of ergonomic teams) and probably contribute towards their positive results.

According to Westgaard and Winkel the positive effects can unfortunately not be quantified more exactly on the basis of the available literature and statements on the interaction effects

between the various intervention strategies are also not possible. In this connection, the studies on organisational culture do not explain which elements are decisive for success: Certain studies put across the impression that these interventions simply represent a more effective way of carrying out mechanical exposition interventions, whilst in contrast other studies emphasise the psychosocial aspect of improved communication.

In the survey by the council of advisors for concerted healthcare sector action (18) the experts arrive at an assessment similar to that made by Westgaard and Winkel. To that effect they summarise the evidence as “being able to attain substantial effects, as defined by a reduction in the frequency and degree of severity of musculoskeletal or back complaints as well as the incapacity for work caused by this“ (page 131) – namely, at least, by those basic preventive approaches, whose focal point is oriented towards the improvement of working conditions, link measures relating to ergonomic, organisational and occupational cooperation and communication structures, whilst proceeding on a participatory basis.

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Addendum

Area	Authors	Studies	Evaluated measures	Study design	Methodological problems	Reported effects	Overall evaluation
Physical Activity	Shepard, 1996**	52 studies (1972 to 1994)	Self-regulated programme, fitness courses (normally 30-45 minutes, 2-3 times a week), programmes include strategies on increasing motivation	Experimental: 5 studies [10%] Quasi-experimental: 14 studies [27%] Non-experimental: 33 studies [63 %]	Hawthorne effect, self-selection, small samples, attrition	Health risk reduction - Reduction of BMI - Reduction of skinfolds and % body fat - Reduction of blood pressure - Reduction of cholesterol - Reduction of the smoking level - Increase in muscle strength, endurance In addition - Reduction in absenteeism - Increase in life satisfaction and well being	"suggestive"
	Dishman et al., 1998	26 articles (1979 to 1995)	Sports groups (at intervals of several weeks), on-site fitness facilities, (supervised) jogging, activity "prescription"; to some extent combination with incentives, health training, risk assessments (Health Risk Assessment - HRA)	Remains ambiguous; however only experimental and quasi-experimental studies included	Self-selection, de-termination of effect by comparing participants from the intervention group with varying degrees of participation instead of comparison with control group, analysis on individual level in spite of randomisation at company level, inadequate description of approaches and results, registration of physical activity	Health risk reduction Result dimensions: self-report on physical activity, documentation on sport group attendance, physiological surrogate (measurement of aerobic fitness), muscle strength and endurance; Total degree of effect over and above all result dimensions at $r = .11$ (95%-KI -.20 to .40)	
	Proper et al., 2002	12 articles on 8 studies (1981 to 1999)	Aerobics, walking, jogging, bicycle ergometer, aerobic dance, calisthenics, ball games	Experimental: 4 studies [50%] Quasi-experimental: 4 studies [50%] Exclusion of non-experimental studies	Inadequate randomisation procedures and inclusion criteria, attrition, low compliance	Work-related effects: - Absenteeism – "limited evidence" of effectiveness - Job satisfaction, job stress, fluctuation – "inconclusive" - objective productivity – no effects	

Area	Authors	Studies	Evaluated measures	Study design	Methodological problems	Reported effects	Overall evaluation
Nutrition/ Cholesterol	<i>Glanz et al., 1996**</i>	a) Nutrition: 10 studies b) Cholesterol: 16 studies (1980 to 1995)	a) Nutrition: - Group education, and indiv. counselling, - Canteen-based programmes and Group education plus canteen-based programmes b) Cholesterol: - indiv. counselling, - Group education, - Media, - Combination	a) Nutrition Experimental: 3 studies [30%] Quasi-experimental: 1 study [10%] Non-experimental: 6 studies [60%] b) Cholesterol Experimental: 8 [50%] Quasi-experimental: 1 [6%] Non-experimental: 7 [44%]	Nutrition: Lack of valid measures Nutrition and cholesterol: Distortion due to self-selection, attrition	Health risk reduction a) Nutrition: - Changes in attitude, - Changes in nutrition (e.g. lower consumption of fat, cholesterol, total energy, salt; increased intake of fruit, vegetables and salad), - Cholesterol level reduction b) Cholesterol: - Cholesterol level reduction, - Weight loss, - Changes in nutrition	"Suggestive/indicative" for both areas
Weight control	<i>Henrikus & Jeffery, 1996**</i>	43 studies (1968 to 1994)	Programmes, to some extent with several focal points: - Behaviour modification (e.g. self-observation and stimulus control) - Training course subjects (in particular diet, activity) - Incentive systems (for groups or individuals upon achieving goals in respect of weight loss or participation) - Competitions (mainly at group level based on the achieved weight loss)	Experimental: 10 studies [23%] Quasi-experimental: 9 studies [21%] Other designs: 24 studies [56%]	Distortion due to self-selection, attrition	Health risk reduction - Weight loss	"Indicative"

Area	Authors	Studies	Evaluated measures	Study design	Methodological problems	Reported effects	Overall evaluation
Smoking cessation	Erikson & Gotlib, 1998**	a) Smoking cessation programmes: 50 articles on 52 studies b) Smoking policies: 29 articles on 29 studies (1968 to 1994)	a) Smoking cessation programmes - Group programmes - Minimum interventions (e.g. self-help manuals) - Use of incentives - Competitions - Medical interventions (e.g. nicotine chewing gum) b) Smoking policies - Introduction of various rules or bans on smoking	a) Smoking cessation programmes Experimental: 23 studies [44%] Quasi-experimental: 10 studies [19%] Non-experimental: 19 studies [37%] b) Smoking policies Experimental: No studies [0%] Quasi-experimental: 3 studies [10%] Non-experimental: 26 studies [90%]	Self-report, short follow-up periods, weak study designs, no conformity between the units where randomisation and analysis are concerned, minor spot checks, no attrition rate documentation, no definition of the appraised population/ recruitment and intervention	Health risk reduction a) Smoking cessation programmes - Group programmes: quit rate median at 23%, net differences between intervention and comparison group between 3% and 25%; - Minimum interventions: lower quit rates and abstinence rates - Competition: improvement of participation rates - Incentives: more ambiguous findings b) Smoking policies - Reduction in cigarette consumption (median 3.4 cigarettes per day) - Decrease in cigarette consumption at workplace - Less explicit findings in respect of cigarette consumption at home - Ambiguous findings in respect of prevalence - Lower values of nicotine and cotinine at workplace	a) "Suggestive" to "acceptable" b) "weak"
Alcohol	Roman & Blum, 1995**	24 articles (1970 to 1995)	1) Interventions oriented towards employees with alcohol problems (mostly in the form of Employee Assistance Programmes) – 19 studies 2) Training courses for superiors – 5 studies	Experimental: 2 studies [8%] Quasi-experimental: 3 studies [13%] Non-experimental: 19 studies [79%]	Lack of replication, weak study designs, self-selection, lack of representativeness of the appraised companies, simplified methodic evaluation, self-reports	Health risk reduction - Changes in attitude and knowledge regarding alcohol problems - Change in the willingness to obtain medical assistance for alcohol problems - Reduction regarding the amount of alcohol consumed or regarding unhealthy drinking behaviour In addition - Changes in working behaviour, e.g. improved performance and less absenteeism, which are attributed to the regained control over drinking and/or changes in drinking behaviour that reduce the interference in role behaviour	"Suggestive"

Area	Authors	Studies	Evaluated measures	Study design	Methodological problems	Reported effects	Overall evaluation
Stress	Barnberg & Busch, 1996	27 studies (1983 to 1992)	Stress management training: - Stress immunisation training according to Meichenbaum - Multi-component stress management training - Relaxation training - Stress management workshops Average total training time 12 hours over a 6 week period; Calculation of effect size d	Remains ambiguous; however, only experimental and quasi-experimental studies included; about half of the studies are available as dissertations	in most cases only short-term effectiveness appraisal (3 months)	Health risk reduction - Individual level: d=-.41, mental, somatic stress symptoms d=.42 coping, control cognitions d=.24 - psycho-physiological symptoms d=.15, n.s - Interface "Individual – Organisation" (anxiety/stress at workplace, burnout, job satisfaction, social support): d=-.27 In addition - Organisation-oriented level (absenteeism, intention to quit, performance and accident/insurance costs): d=.22 - No information on specific effects of individual training procedures	
	Murphy, 1996**	64 articles (1974 to 1994)	- Muscle relaxation (PMR) (20%) - Cognitive-behavioural methods (20%) - Meditation (9%) - Bio-feedback (6%) - Combination of PMR with one of the listed methods (47%) - Other methods (27%) carried out in 73% of the studies as preventive measure (i.e. voluntary offer for all employees)	Experimental: 34 studies [53%] Quasi-experimental: 15 studies [23%] Non-experimental: 15 studies [23%]	To some extent weak study designs (positive results more frequent for studies with weak designs), small sample size, short follow-up periods	Health risk reduction - Physiological/biochemical: With regard to blood pressure minimum intervention effect (medium reduction in intervention group 7.8 mm Hg/5 mm Hg vs. 4.9mm Hg/2.7 mm Hg in comparison group) - Psychological/cognitive: In intervention group anxiety reduces clearly as against comparison group - Somatic complaints: 60% significant reductions in intervention group (e.g. nervousness, sleep disorders), however normally without control group comparison – effect therefore remains doubtful In addition - Job satisfaction: No effects in the randomised, controlled studies - Medical costs and hospitalisation: 3 studies (one controlled) show reductions Absenteeism: contradictory results	"Indicative"

Area	Authors	Studies	Evaluated measures	Study design	Methodological problems	Reported effects	Overall evaluation
Cancer risk factors	Janer et al., 2002	45 studies (1984 to 2000)	Interventions on tobacco consumption, eating behaviour, physical activity, weight control, alcohol, UV-radiation; single and multi-component programmes	Experimental: 32 studies [71%] Quasi-experimental: 13 studies [29%] Exclusion of non-experimental studies	Negative distortion due to transfer of intervention effects to non-participants, low participation rates, self-selection	Health risk reduction - Smoking: Net abstinence rate M = 6.1% - Nutrition: significant, yet modest effects with regard to the consumption of fruit and vegetables, intake of fat and dietary fibre - Physical activity: Positive effects, only half of which significant - Weight control: short-term effects greater than long-term	Modest yet positive effects
Back training	Nentwig, 1999		An appropriate short presentation is not possible at this point, as this work already includes a summary of various reviews etc. The results have been summarised in the text.				
Multi-component programmes	Heaney & Goetzl, 1997**	47 articles on 35 studies (1978 to 1996)	Initially frequent screening or health risk assessment (among other things, physiological dimensions, questionnaire) including feedback; Intervention components: - Information only (8) - Information and relaying of skills in different courses (nutrition, stress mgt., back training etc.) (14) - Information, relaying of skills and changes in company policy or working environment (e.g. bans on smoking, setting-up of sports facilities, canteen food) (13) - Individual advice on risk reduction (15) Further difference: Focus on all or only those employees at high risk	Experimental: 9 studies [25%] Quasi-experimental: 15 studies [44%] Non-experimental: 11 studies [31%] (In general the studies were included in the rating and not the articles; one study, however was given two ratings)	Small sample size, no consideration given to interclass-correlation	Different effects were reported in studies; Health risk reduction - Improved cardiovascular fitness - Fewer smokers - Increase in physical activity - Reduction in alcohol consumption and intake of salt and fat - Improvement of blood pressure and cholesterol - Weight reduction - Increased safety belt use - Fewer frequent and serious accidents - Improvement in eating habits - Reduction (of health risk and) in mortality In addition: - Reduction in absenteeism, - reduction in sick days	"Indicative/ acceptable"

Area	Authors	Studies	Evaluated measures	Study design	Methodological problems	Reported effects	Overall evaluation
	Pelletier, 1996	26 (?) articles (1992 to 1995)	Various combinations of measures: HRA, newsletter, self-help books, videos, courses on behaviour changes, individual advice; setting-up of sport facilities, company regulations on smoking, canteen food;	Including control group: 12 studies [60%] Excluding control group: 8 studies [40%] → only articles with health and cost results from comprehensive health promotion programmes	To some extent no control groups, self-selection, small samples	Health risk reduction - Reduction in high-risk behaviour - Decrease in "depressive events" - Reduction of blood pressure and cholesterol level - Decrease in back pains - Increase in physical activity In addition - Reduction of sickness costs - Reduction in absenteeism - Fewer visits to doctor, hospitalisation and injuries in a high-risk group - Reduction in self-reported illnesses - Reduction in sick days - Increase in job satisfaction ROI \$1:\$3.4 (1986-2000); ROI 179%; ROI \$1:\$3.6	
	Pelletier, 1999	11 articles (1994 to 1998)	Various individual or combined measures: Family policy (e.g. flexible working hours), health training courses, employee assistance programme, individual advice, (mammogram) screenings, programmes on the appraisal/reduction of health risk factors (HRA, Healthtrac), programmes on fitness, back, nutrition, weight control and stress management; to some extent different programmes for employees with high risk vs. low risk following screening; one study contained additional change in the working environment	Experimental: 2 studies [18%] Quasi-experimental: 9 studies [82%] → only articles with health and cost results from comprehensive health promotion programmes	Differential attrition in samples, varying variable definitions (to some extent participation rates, calculation of cost effects), to some extent short follow-ups, analysis on individual level in spite of randomisation at company level, no consideration given to interclass-correlation	Health risk reduction - Fewer smokers - Employees maintain their weight and keep to sporting activities - increased use of safety belts - decrease in cholesterol level - (Early) diagnosis of (breast) cancer - Reduction in the proportion of employees at high risk In addition - Reduction of expenditure involved in illness - Fewer days in hospital and visits to doctor - Reduction in sickness-related absenteeism - Less non-productive time ROI regarding sickness costs (medical claims) 1:1.81; ROI 1:6.47 – 8.81 (Citibank study); 1:3.24	

Area	Authors	Studies	Evaluated measures	Study design	Methodological problems	Reported effects	Overall evaluation
	Pelletier, 2001	12 articles (1998 to 2000); additionally 3 articles from earlier review	(mammogram, prostate gland, diabetes etc.) screenings, health education, implementation of influenza inoculation, courses for pregnant women	Experimental: 1 study [8%] Quasi-experimental: 2 studies [17%] Non-experimental: 9 studies [75%] → only articles with health and cost results from comprehensive health promotion programmes	Analysis on individual level in spite of randomisation at company level, differential attrition in samples	Health risk reduction - Lowering of the glucose level and (glyco-) haemoglobin - Fewer cases of flu and complications - Less headaches - Lesser number of caesarean sections, premature births and underweight newborns - Decrease in risk factors In addition - Fewer sick days - Fewer visits to the doctor and days in hospital ROI 1: 4.56 – 4.73	"Indicative" with regard to positive clinical and cost effects

* An overall evaluation was not carried out in all reviews.

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