



**An Roinn Sláinte**  
**Department of Health**

**AN UMBRELLA REVIEW OF THE EFFECTIVENESS AND COST-EFFECTIVENESS OF WORKPLACE WELLBEING PROGRAMMES**

A Department of Health Research Paper, 2018

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The views in this report are those of the authors and not necessarily those of the Minister for Health, nor the Department of Health.

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## GLOSSARY

**Healthy workplace:** “A healthy workplace is one in which workers and managers collaborate to use a continual improvement process to protect and promote the health, safety and well-being of all workers and the sustainability of the workplace by considering the following, based on identified needs: health and safety concerns in the physical work environment; health, safety and well-being concerns in the psychosocial work environment, including organization of work and workplace culture; personal health resources in the workplace; and ways of participating in the community to improve the health of workers, their families and other members of the community” (WHO, 2010).

**Workplace health programmes:** “Workplace health programmes are a coordinated and comprehensive set of health promotion and protection strategies implemented at the worksite which include programs, policies, benefits, environmental supports, and links to the surrounding community designed to encourage the health and safety of all employees” (CDC).

**Workplace wellbeing programmes:** Workplace wellbeing programmes are a subset of workplace health programmes and for the purpose of this review include health promotion and wellness programmes. These include single or dual focus interventions (e.g. physical activity, dietary behaviour and weight management; smoking and alcohol behaviours; stress, anxiety and depression) and multi-focus programmes. Multi-focus programmes are often referred to in the literature as workplace health promotion programmes, workplace or organisational wellness programmes. They involve a combination of physical activity, weight, nutrition and physical activity, stress management and anxiety/depression, and lifestyle interventions.

**Systematic reviews:** A systematic review is a review of literature that has a detailed and comprehensive plan and search strategy derived *a priori*. It is undertaken with the goal to reduce bias by identifying, appraising, and synthesizing all relevant studies on a particular topic (Uman, 2011).

**Meta-analyses:** A meta-analysis is a systematic review that synthesizes the data from several studies into a single quantitative estimate or summary effect size. Effect sizes measure the strength of the relationship between two variables, thereby providing information about the magnitude of the intervention effect (i.e., small, medium or large) (Uman, 2011).

**Effectiveness:** Effectiveness is concerned with whether an intervention achieves its objective. To measure effectiveness the objective of an intervention is captured in a

quantified outcome indicator and an approximately designed methodology is used to determine if the intervention resulted in a change in the outcome indicator in the desired direction.

**Effect size:** Effect size is a way of quantifying the difference between two groups, e.g. workers who participated in a programme and workers who did not. It has many advantages over tests of statistical significance. Effect size emphasises the size of the difference between groups rather than confounding this with the sample size (number of people participating in the programmes) (Coe, 2002).

One of the most popular effect sizes is Cohen's  $d$  (Cohen, 1988). This is a measure of the difference between the means of the two groups being compared. The difference is divided by the standard deviation, which standardises the result so that we are told how many standard deviations the two groups are apart (Clark-Charter, 2003).

**Effect size and meta-analysis:** The different effect sizes from different primary studies can be converted to a common form. This is what is done in meta-analysis. Typically, other effect sizes are converted to either  $d$  or  $r$ . It is then possible to create a combined effect size that summarises the results of a number of studies (Clark-Charter, 2003).

**Effect size and classifications:** Cohen (1988) reports work he conducted to measure the effect sizes found by behavioural scientists using various designs and data. For each situation he described what he considered to be a small effect, a medium effect and a large effect. For he said that 0.2 (or just under a quarter of a standard deviation difference between the conditions) is a small effect size, 0.5 (or half a standard deviation) is a medium effect and 0.8 (or over three-quarters of a standard deviation) is a large effect size (Clark-Charter, 2003). Many researchers use this "classification" of small, medium and large when referring to the effect sizes found. Other researchers have argued that the term "small, medium and large" should be based on the context and nature of the intervention, i.e. in some cases an intervention with a  $d = 0.5$  can have substantial impacts in practice.

**Cost-benefit analysis (CBA):** In a CBA, both costs and consequences are expressed in monetary items. An intervention may therefore be considered efficient when the benefits outweigh the costs. However, a CBA is not that easy, because of the difficulties in translating the consequences to monetary terms (Van der Roer, 2006). For such a translation, diverse methods are available. One such technique is the so-called "willingness-to-pay", where respondents are being asked what they would pay for an intervention given a certain effect (Drummond et al., 1997). In summary, cost benefit analysis expresses both the effects and costs of intervention in monetary terms. The decision rule focuses on whether monetary

benefits exceed monetary costs. For example, whether Net benefit (NB) > 0, benefit to cost ratio (BCR) > 1 and return on investment (ROI) > 0.

**Cost-effectiveness analysis (CEA):** In a CEA, the difference in costs between the interventions is compared to the difference in interventions effects, expressed as behaviour, health-specific, or work-related effects. For example, the effects can be expressed as kilocalories expended by physical activity, grams of fruit and vegetables intake, mml per litre blood cholesterol, days of sick leave, et cetera. As part of a CEA, a cost-effectiveness ratio is calculated, representing the incremental effects of an intervention related to the incremental costs (Proper, 2007).

**Cost-utility analysis (CUA):** A CUA is a special form of cost-effectiveness analysis. A CUA compares the costs of the interventions with the effect defined as utility. Commonly used utility measures in economic evaluation of health interventions are the quality-adjusted life years (QALYs), which takes into account both the duration of life and the quality of life (Proper, 2007).

In summary, in cost-effectiveness analysis, effects are expressed in common non-monetary measure while costs are expressed in monetary terms. The difference in cost between interventions is divided by the difference in their effect, and the ratio is called the incremental cost-effectiveness ratio (ICER). The decision rule focuses on whether the ICER is less than a threshold monetary costs (ICER < threshold). Cost utility analysis is a form of CEA where the outcomes are measured in utility. For instance, NICE recommends funding interventions for which the cost per quality-adjusted life year (QALY) gained is less than £20-30,000.

## EXECUTIVE SUMMARY

### Policy Context and Workplace Wellbeing Programmes

The Healthy Workplace Framework is an important component of the Government-led Healthy Ireland agenda, which “aims to create an Irish society where everyone can enjoy physical and mental health and wellbeing to their full potential, and where wellbeing is valued and supported at every level of society”.

Workplaces directly influence the physical, mental, economic and social wellbeing of workers and in turn, the health of their families, communities and society. With more than two million people employed in Ireland, the workplace offers an ideal setting and infrastructure to support the promotion of health to a large audience. According to the World Health Organisation (WHO), workplace health programmes are one of the best ways to prevent and control chronic disease, and also to support mental health. Workplace health programmes “refer to a coordinated and comprehensive set of strategies which include programs, policies, benefits, environmental supports, and links to the surrounding community designed to meet the health and safety needs of all employees.” (CDC).

A Healthy Workplace Framework across both public and private sectors aims to encourage and support the development of health and wellbeing programmes in all places of employment. Key elements in the development of a Healthy Workplace Framework include a number of literature reviews, a policy landscape paper, a consultation, building capacity, development of an accreditation model, and development of resources. This research paper is an input into the Framework.

The focus of this review is on workplace wellbeing programmes. These are a subset of workplace health programmes, and include single or dual focus programmes (e.g. physical activity, dietary behaviour and weight management; smoking and alcohol behaviours; stress, anxiety and depression) and multi-focus programmes. Multi-focus programmes are often referred to in the literature as workplace health promotion programmes, and workplace or organisational wellness programmes. They involve a combination of physical activity, weight, nutrition and physical activity, stress management and anxiety/depression, and lifestyle interventions. This review focused on two questions in relation to workplace wellbeing programmes: Do they have a favourable effect? Are they worth the investment?

## Do Workplace Wellbeing Programmes Have A Favourable Effect?

The means of assessing research results on the effect of interventions has evolved from asking “Is the difference between experimental groups reliable?” to “Is the difference meaningful?” to “Is this what other people are finding?” (Howell, 2012). Researchers form conclusions on the first question based on measures of statistical significance, on the second question based on indices of importance or effect size (measures of “practical significance”), and on the third question based on systematic reviews and meta-analysis (summary or pooled measures of practical significance).<sup>1</sup>

This review summarises the conclusions of over 60 meta-analyses and systematic reviews on the effect of workplace wellbeing interventions. It summarises the evidence as “strong evidence” where it is the conclusion of at least two meta-analyses, as “moderate evidence” where it is the conclusion of the one meta-analysis found, and as “some evidence” where it is the conclusion of the systematic review(s) found.

A range of measures of effect are used in the reviews; they fall into the three broad categories of health behaviours, health outcomes, and economic or organisational outcomes. The research assumes an implicit logic model of interventions leading to changes in behaviour, which lead to changes in health, which lead to changes in organisation performance. However, very few reviews look across all three categories of effect. Most of the evidence from meta-analysis is on health outcomes, followed by organisational outcomes, and finally, health behaviours.

Based on a review of meta-analyses and systematic reviews, this review concludes there is strong evidence of a favourable effect of workplace wellbeing programmes on the health behaviours of physical activity and smoking cessation; on health outcomes of weight and BMI, stress/distress, anxiety and depression, and mental wellbeing; and on organisational outcomes of work ability and sickness absences.

Table 1 summarises the findings by type of workplace wellbeing programme.

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<sup>1</sup> A systematic review is a review of studies with the goal of reducing bias by identifying, appraising, and synthesizing all relevant studies on a particular topic. A meta-analysis is a systematic review that synthesizes the data from several studies into a single quantitative estimate or summary effect size (Uman, 2011).



**Table 1: Summary of conclusions on effect by type of programme**

HEALTH BEHAVIOURS	HEALTH OUTCOMES	ORGANISATIONAL OUTCOMES
<ul style="list-style-type: none"> <li>✓ <b>PHYSICAL ACTIVITY &amp; FITNESS (PAP)</b></li> <li>✓ <b>SMOKING (SCP)<sup>5</sup></b></li> <li>✓ <b>PHYSICAL ACTIVITY<sup>1</sup> (PANP)</b></li> <li>✓ <b>FRUIT &amp; VEG. (NDP)</b></li> <li>✓ <b>DIETARY (NDP)</b></li> </ul>	<ul style="list-style-type: none"> <li>✓ <b>WEIGHT &amp; BMI (PANP)</b></li> <li>✓ <b>WEIGHT &amp; BMI<sup>2</sup> (PAP)</b></li> <li>✓ <b>BODY FAT % (PANP)</b></li> <li>✓ <b>PHYSIOLOGICAL, E.G. BLOOD PRESSURE, CHOLESTEROL (SMP)</b></li> <li>✗ <b>PHYSICAL WELL-BEING (WHPP)</b></li> <li>✓ <b>MENTAL WELLBEING (WHPP)</b></li> <li>✓ <b>STRESS/DISTRESS (SMP)</b></li> <li>✓ <b>STRESS (PAP)</b></li> <li>✓ <b>ANXIETY &amp; DEPRESSION (ADP)</b></li> <li>✓ <b>ANXIETY (PAP)</b></li> <li>✓ <b>ANXIETY &amp; M. HEALTH (SMP)</b></li> <li>✓ <b>WELLBEING<sup>3</sup> (ADP)</b></li> <li>✓ <b>SELF-PERCEIVED HEALTH (WHPP)</b></li> </ul>	<ul style="list-style-type: none"> <li>✓ <b>WORK ABILITY<sup>4</sup> (WHPP)</b></li> <li>✓ <b>TASK COMPLETION<sup>3</sup> (ADP)</b></li> <li>✓ <b>SUPERVISOR'S RATING<sup>3</sup> (ADP)</b></li> <li>✓ <b>JOB SATISFACTION (WHPP)</b></li> <li>✓ <b>PRODUCTIVITY (WHPP)</b></li> <li>✓ <b>PRODUCTIVITY (SMP)</b></li> <li>✓ <b>SICKNESS ABSENCES (WHPP)</b></li> <li>✗ <b>SICK LEAVE (PAP)</b></li> <li>✓ <b>ABSENTEEISM (WHPP)</b></li> <li>✗ <b>ABSENTEEISM (SMP)</b></li> <li>✓ <b>WORK ATTENDANCE (PAP)</b></li> </ul>

*Degree of evidence:*

**Blue:** strong evidence, conclusion of at least two meta-analyses

**Orange:** moderate evidence, conclusion of the one meta-analysis found

**Grey:** some evidence, conclusion of the systematic review(s) found

MA = meta-analysis, SR = systematic review.

*Programme Abbreviations:*

PANP = Physical Activity *and* Nutrition Programmes; PAP = Physical Activity Programmes; NDP = Nutrition and Dietary Programmes; WLM = Weight loss or management; SMP = Stress Management Programmes; A&DP = Anxiety and Depression Programmes; WHPP = Workplace Health Promotion Programmes; SCP = Smoking Cessation Programmes; ARP = Alcohol Reduction Programmes.

<sup>1</sup> Reported as limited evidence for educational only interventions. <sup>2</sup> Reported as low quality evidence.

<sup>3</sup> Programme effects diminish over time. <sup>4</sup> One meta-analysis is based on two studies, and found the effect size was higher for the study rated as 'Poor/fair quality' 0.41 (0.04, 0.78) than the study rated 'Good/excellent quality' 0.10 (-0.14, 0.35). <sup>5</sup> In one meta-analysis the pooled effect was present at 6 and 12 months but was not present after 12 months. In the other meta-analysis there was a pooled effect for most but not all SCP intervention types.

## Are Workplace Wellbeing Programmes Worth the Investment?

In practice, how one decides whether workplace wellbeing programmes are worth the investment depends on one's perspective, as it influences the lens through which interventions are viewed and the basis upon which judgements are made. For example, an employer facing a tight labour market might view workplace wellbeing programmes as being worth the investment if they facilitate hiring and retention. An organisation trying to maximise return might view them as being worth the investment if they help improve worker performance and costs. On the other hand, a public health worker might view workplace wellbeing programmes as one of a number of positive tools to help improve health, and therefore worth the investment.

Traditional public policy analysis uses cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA) to help form a conclusion. CBA expresses both the effects and costs of interventions in monetary terms, and judges an intervention to be worth the investment if the benefits exceed the costs. In CEA the effects are expressed in a common non-monetary measure while costs are expressed in monetary terms, and it judges an intervention to be worth the investment if the difference in cost between interventions, divided by the difference in their effect (the incremental cost effectiveness ratio), is less than a threshold monetary value (ICER < threshold). This report found a smaller number of reviews of CBA and CEA than reviews of effectiveness.

One review, Van Dongen et al., (2011), examined CBAs on physical activity and/or nutrition programmes. It reported that the financial returns from these programmes are positive overall. It found average costs per person of \$155 (n = 21), and benefits of \$324 (n = 15) for absenteeism, \$187 (n = 13) for medical benefits, and \$158 (n = 3) for presenteeism. It also found that summary measures would lead to judgements that investment in these programmes are worth the investment; median net benefit of \$91, median benefit to cost ratio of 1.42, and median return on investment of 42%.

However, when they examined the results by type of study they found the results do not hold for randomised controlled studies (13 NRS, 4 RCT). This may be due to better design of RCTs, or because the follow-up period in the RCTs is shorter than in the non-randomised studies (i.e. due to the shorter time period covered in RCTs they cover costs which are upfront, but not benefits which occur outside the period examined). The authors conclude that "Therefore, conclusions about the extent to which financial return estimates were overestimated in NRSs cannot be made." It is also important to bear in mind that additional types of benefits associated with the programmes were not captured in the studies (i.e. all costs were captured, but not necessarily all benefits).

The same authors undertook a separate review on the cost-effectiveness of the same programmes. It found that the evidence suggests they are more effective and more costly than usual care, e.g. they found a cost of \$26 per kilogram of weight loss. They note that the vast majority of studies do not compute QALYs for which established thresholds are available, and that there are no established thresholds for the outcomes that are measured. As a result, there are no thresholds against which to compare the extra outcome per extra cost. For instance, decision makers' willingness to pay for improvements in the typical outcome indicators (reduced body weight, cholesterol levels and CVD risks) is unknown. Therefore, "technical" conclusions on cost-effectiveness of interventions cannot be made.

There is some evidence of favourable financial returns for mental health programmes. One systematic review states that there is insufficient evidence to form a conclusion, while a more recent review concludes, with some reservation, that there is favourable evidence (9 out of 10 studies). There is evidence of positive financial returns from workplace health promotion programmes. A meta-evaluation of WHPPs, Chapman (2012), finds "average reductions in sick leave, health plan costs, and workers' compensation and disability insurance costs of around 25%". Chapman also points out that more recent studies report larger average effects and higher cost-benefit yields than the earlier ones, and that recent studies tend to have better study methodology. The two systematic reviews investigating WHPPs also find positive returns.

**Table 2: Summary of evidence on Cost Benefit Analysis and Cost Effectiveness Analysis**

PROGRAMMES	FINANCIAL RETURNS	COST EFFECTIVENESS/UTILITY
<b>PHYSICAL ACTIVITY &amp;/ NUTRITION</b>	~ <b>INCONCLUSIVE/INS. STUDIES (1 SR)</b>  <b>AVERAGE POSITIVE F. RETURNS</b>  NB = \$91, BCR = 1.42, ROI = 42%  <b>BUT:</b>  F. RETURNS NOT +VE IN RCTS FOLLOW-UP SHORTER IN RCTS NOT ALL BENEFITS COUNTED <sup>1</sup>	? <b>UNKNOWN (1 SR)</b>  EVIDENCE OF BETTER OUTCOMES AT HIGHER COST BUT NO ESTABLISHED "WILLINGNESS TO PAY" THRESHOLDS TO COMPARE AGAINST
<b>PROMOTING MENTAL HEALTH</b>	✓ <b>ECONOMIC RETURNS<sup>2</sup></b>  1 OF 2 SR	? <b>UNKNOWN (2 SRs)</b>  NO STUDIES REPORT CE MEASURES
<b>SINGLE FOCUS OR MULTI-COMPONENT</b>	✓ <b>FINANCIAL RETURNS</b>  1 OF 1 MA AND 2 OF 2 SRs	? <b>UNKNOWN (3 SRs)</b>  NO STUDIES REPORT CE MEASURES
MA = meta-analysis, SR = systematic review. <sup>1</sup> Benefits covered in studies were medical, absenteeism, and presenteeism. <sup>2</sup> Most of these studies looked solely at the impacts for employers, either in terms of paying for the health care of their employees or dealing with absenteeism and poor performance at work. <b>Blue:</b> strong evidence, conclusion of at least two meta-analyses <b>Orange:</b> moderate evidence, conclusion of the one meta-analysis found <b>Grey:</b> some evidence, conclusion of the systematic review(s) found		

# 1. INTRODUCTION

## 1.1 Background and Policy Rationale

The Healthy Workplace Framework is an important component of the Government-led Healthy Ireland agenda, which “aims to create an Irish society where everyone can enjoy physical and mental health and wellbeing to their full potential, and where wellbeing is valued and supported at every level of society”.

The Healthy Ireland website notes that as there are over two million people employed in Ireland, the workplace can make an important contribution to healthier communities. Workplaces directly influence the physical, mental, economic and social wellbeing of workers and in turn, the health of their families, communities and society. It therefore offers an ideal setting and infrastructure to support the promotion of health to a large audience. According to the World Health Organisation (WHO), workplace health programmes are one of the best ways to prevent and control chronic disease, and also to support mental health. Workplace health programmes “are a coordinated and comprehensive set of health promotion and protection strategies implemented at the worksite which include programs, policies, benefits, environmental supports, and links to the surrounding community designed to encourage the health and safety of all employees” (CDC).

A Healthy Workplace Framework across both public and private sectors aims to encourage and support the development of health and wellbeing programmes in all places of employment. Key elements in the development of a Healthy Workplace Framework include a number of literature reviews, a policy landscape paper, a consultation, building capacity, development of an accreditation model, and development of resources. This research paper was prepared for the Health & Wellbeing Programme in the Department of Health as an input into the Framework.

## 1.2 Purpose and Scope

The purpose of this review is to summarise evidence on the benefits and costs of workplace well-being programmes. The review focuses on two questions as follows:

1. What is the evidence on the effectiveness of workplace wellbeing programmes in terms of impact on health behaviours, health outcomes and economic/organisational measures?

2. What is the evidence on how the benefits of workplace wellbeing programmes compare to costs in terms of financial returns (ROI, CB ratio), cost-effectiveness or cost-utility?

Separate reports prepared for the Health & Wellbeing Programme in the Department examine factors organisations should consider when developing healthy workplaces (Murphy, R., O'Donoghue, E., & Doyle, C., 2018) and public policy mechanisms to support healthy workplaces and workplace health programmes (Murphy, R., & O'Donoghue, E., 2018). In addition, the Health & Wellbeing Programme was interested in workplace interventions in which workers could participate, particularly interventions for mental health, nutrition and/ or physical activity, smoking cessation and alcohol consumption. Interventions with a primary health and safety character were outside its scope (e.g. interventions to reduce musculoskeletal disorders), as were structural changes (e.g. working arrangements which can impact on workers, such as flexible working arrangements or shift working).

The focus of this review is on workplace wellbeing programmes (a subset of workplace health programmes as defined earlier). Workplace wellbeing programmes include single or dual focus programmes (e.g. physical activity, dietary behaviour and weight management; smoking and alcohol behaviours; stress, anxiety and depression) and multi-focus programmes. Multi-focus programmes are often referred to in the literature as workplace health promotion programmes, workplace or organisational wellness programmes. They involve a combination of physical activity, weight, nutrition and physical activity, stress management and anxiety/depression, and lifestyle interventions.

### **1.3 Method and Limitations**

The methodology was tailored to the questions and the timeframe available. A draft analysis on Question 1 was required within four months (most of the searches were undertaken in Q2 2016). Questions 1 and 2 require a summary of conclusions on the effectiveness or cost effectiveness of interventions which this review bases on conclusions in systematic reviews and meta-analyses of primary studies (i.e. a review of reviews was undertaken). More details on the methodology and approach are provided below.

The means of assessing research results on effectiveness has evolved over the last number of decades (Howell, 2012). Traditionally, researchers asked the question: “Is the difference between experimental groups reliable?” This asked whether, if the study was run again, the results would be the same. Conclusions were made on whether differences between groups were “real” or due to chance based on measures of statistical significance. Researchers then moved to consider the question: “Is the difference meaningful?” Where the difference between groups was real, this asked whether the difference was too small to matter. Conclusions were made on whether differences between groups were of practical significance based on indices of importance or effect size. More recently, researchers have considered the question: “Is this what other people are finding?” Here, the focus is on combining the results of all studies on a topic to conclude on effect. Conclusions are based on systematic reviews (a review of studies with the goal of reducing bias by identifying, appraising, and synthesizing all relevant studies on a particular topic), or meta-analysis (a systematic review which synthesizes the data from several studies into a single quantitative estimate or summary effect size). Effect sizes measure the strength of the relationship between two variables, thereby providing information about the magnitude of the intervention effect (i.e., small, medium, or large).

For question 1, a review of systematic reviews and meta-analyses forms the basis for analysis. When interpreting the results it is important to remember that the terms “small, medium and large” should be based on the context and nature of the intervention, i.e. in some cases an intervention with a “small” or “medium” effect can have substantial impacts in practice.

The report sets our overall summary relative to other literature reviews. For example, reference to the findings of other reviews of reviews (e.g. a report on physical activity and healthy diet by Proper 2007 prepared for the WHO, a report on mental health interventions by Joyce et al., 2015 and a report by Fenton et al., 2014) is made in order to put this review’s findings in context.

### ***Search terms***

The search strategy involved a key word search of peer-reviewed databases. The Cochrane PICO acronym was used to search databases. A sample of the search string used is presented at the end of this chapter. In addition, a key word search of Google Scholar was undertaken.

### ***Data sources***

The search strategy involved a key word search of peer-reviewed databases of relevant subject areas (namely health, economics, decision making and public policy interventions) and study type (systematic reviews and meta-analyses). References in literature reviews (scoping or umbrella) identified via key organisations' websites and Google were also searched. Citations in Web of Science Database of systematic reviews and meta-analyses identified in one scoping review (Fenton, 2014) were additionally searched. Databases and key websites searches are presented at the end of this chapter.

### ***Inclusion criteria***

Studies were included if they were a systematic review or meta-analysis of a workplace intervention including adults addressing mental health, nutrition and/or physical activity, smoking cessation and alcohol consumption, or workplace health promotion.

### ***Exclusion criteria***

Studies were excluded if they were not a systematic review or meta-analysis, if an article examined association only and not intervention effects, or where the search strategy focused exclusively on one country (e.g. England, or Australia).

### ***Data extraction***

Data extraction and synthesis involved three elements.

1. Each review was briefly described in terms of interventions examined, outcomes, study inclusion criteria, outcomes reported and conclusion (presented as Appendix B).
2. Each review was entered into a summary table that captures the type of intervention, outcome focus, conclusion on effect, summary sentence and review type, and author (presented as Appendix A).
3. A synthesis was produced (presented in the Main Report) using a colour code for strength of effect or not, as follows:

**Strong evidence**, conclusion of at least two meta-analyses

**Moderate evidence**, conclusion of the one meta-analysis found

**Some evidence**, conclusion of the systematic review(s) found

Inconclusive, mixed findings or insufficient study number/quality

Do not know, not measured in any meta-analysis or systematic review

Across the field of generic health promotion and risk reduction, a consensus has emerged that emphasis needs to be placed on programmes which have been conceptualised along a continuum, with promotion of wellness at one extreme and interventions for established problems at the other (Rae-Grant 1994). Where possible, this report distinguishes interventions within each programme category according to the three levels of prevention along a continuum of *universal* (interventions for an entire working population), *selective* (for those groups deemed to be high risk) and *indicated* (for individuals or groups that show early signs of, or have been diagnosed with, problems). Evidence is also reported to specific sectors (Chapter 2 and Appendices A and B). The overall synthesis of evidence, in the Summary Report and Chapter 2, excludes reviews which focus solely on specific sectors.

### ***Assessment of quality***

By selecting only systematic reviews and meta-analysis this review had an element of implied quality assurance. This review did not explicitly undertake an assessment of the quality of meta-analysis and systematic reviews examined. A recent review of systematic reviews and meta-analyses by Brunton et al. (2016) examined many of the reviews covered in this report, assessed their quality using the 'AMSTAR' rating system, and concluded: "Overall, the reviews of effectiveness were of moderate to high methodological quality."

### ***Limitations***

Key limitations include the fact that most of the systematic reviews and meta-analyses were restricted to English-language publications, that there is a risk of publication bias in the individual studies reviewed, it does not distinguish findings by source of funding for studies, and that this review does not explicitly quality appraise the studies covered.

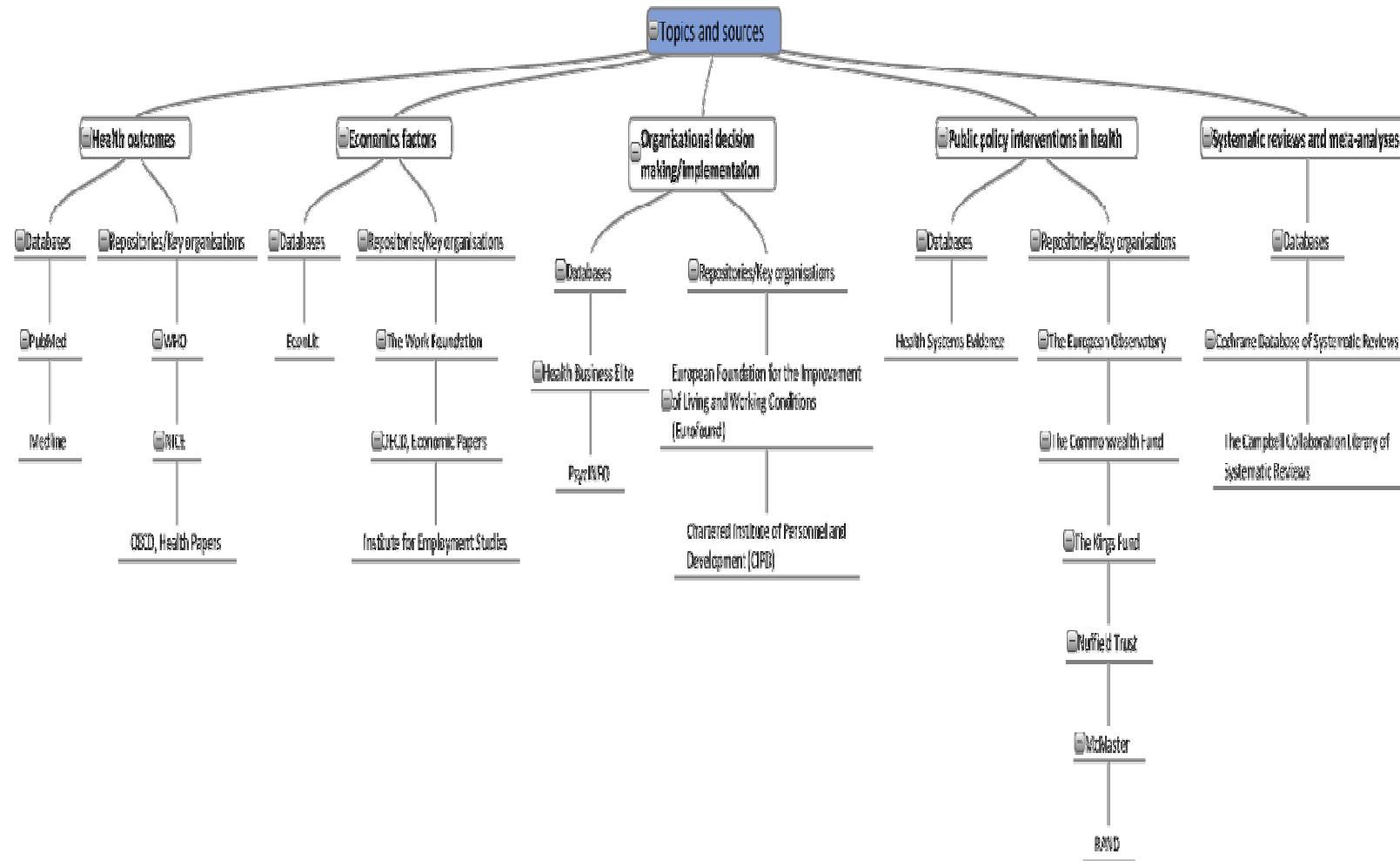
### ***Review***

This report was subject to internal and external review as follows (a) by colleagues in the Research Services Unit, Department of Health not involved in the production of the review and (b) by professionals working in the area of workplace health promotion and wellbeing (listed in the acknowledgements at the end of this report).





Databases and websites searched by “topic”



## 2. DO WORKPLACE WELL-BEING PROGRAMMES HAVE A FAVOURABLE EFFECT?

### 2.1 PHYSICAL ACTIVITY, NUTRITION, WEIGHT MANAGEMENT AND LOSS

There is evidence that programmes addressing physical activity, nutrition and weight management/loss have a **favourable impact on health behaviours and health outcomes**. Few studies have examined **organisational benefits**.

With regard to health **behaviours** there is **strong evidence** that physical activity programmes **increase physical activity and fitness** (three meta-analyses). The review did not find any meta-analysis of pooled effects of physical activity and nutrition programmes, nutrition and dietary programmes, or weight loss/management programmes. It did find **some evidence** that physical activity and nutrition programmes **increase physical activity** (one systematic review) and that nutrition and dietary programmes **increase fruit and vegetable intake and improve dietary behaviour** (one systematic review respectively).

There is also evidence that these programmes result in **positive health outcomes**. There is **strong evidence** that physical activity and nutrition programmes reduce **weight and BMI** (two meta-analyses), and **moderate evidence** that they reduce **body fat** (one meta-analysis). There is **moderate evidence** that physical activity programmes alone reduce **weight and BMI, and stress and anxiety** (one meta-analysis). Few analyses or reviews examine **organisational benefits**; there is **moderate evidence** of a favourable effect of physical activity programmes on **work attendance**.

PROGRAMMES	HEALTH BEHAVIOURS	HEALTH OUTCOMES	ORGANISATIONAL OUTCOMES
PHYSICAL ACTIVITY &/ NUTRITION	✓ PHYSICAL ACTIVITY 1 OF 1 SR <sup>1</sup>	✓ WEIGHT & BMI 2 OF 2 MAS ✓ BODY FAT % 1 OF 1 MA	? NO MA OR SR
PHYSICAL ACTIVITY	✓ PHYSICAL ACTIVITY & FITNESS 3 OF 4 MAS	✓ WEIGHT & BMI 1 OF 1 MA <sup>2</sup> ✓ STRESS 1 OF 1 MA ✓ ANXIETY 1 OF 1 MA	✓ WORK ATTENDANCE 1 OF 1 MA × SICK LEAVE 1 OF 1 SR
NUTRITION & DIETARY	✓ FRUIT & VEG. 1 OF 1 SR ✓ DIETARY 1 OF 1 SR	~ INCONCLUSIVE/INS. STUDIES 1 MA & 2 SR	~ INCONCLUSIVE/INS. STUDIES 1 SR
WEIGHT LOSS MA	? NO MA OR SR	? NO MA & 1 SR	? NO MA OR SR

MA = meta-analysis, SR = systematic review.

<sup>1</sup>Limited evidence for educational only interventions. <sup>2</sup> Reported as low quality evidence.

**Physical Activity and Nutrition Programmes:** Two meta-analyses examine the effectiveness of programmes which combine physical *and* dietary behaviour interventions on workplaces. Both focus on **weight-related outcomes**. One meta-analysis (Verweij et al, 2011) produces pooled estimates of the effect of workplace interventions to increase physical activity *and* to improve dietary behaviour (i.e. interventions focusing on both behaviours), while the other (Anderson et al. 2009) produces estimates of the effects of interventions to increase physical activity *and/or* improve dietary behaviour (i.e. interventions focusing on either or both behaviours). Both conclude that the interventions significantly reduce employees' weight and BMI. Anderson et al. (2009) notes that the findings appear to be applicable to both male and female employees, across a range of worksite settings. Verweij et al. (2011) also conclude that the interventions reduce body fat.

One meta-analysis examines the effectiveness for a selective group of workers, namely healthcare professionals (Power et al, 2014). It estimates a significant reduction in weight of employees receiving the interventions, although it concludes there are insufficient studies for healthcare professionals to draw firm conclusions.

**Physical Activity Programmes:** A previous review of reviews by Dugdill et al. (2007) for NICE concluded "there is inconclusive, review-level evidence that workplace physical activity interventions have a significant effect on physical activity." This was based on the fact that, of the two reviews judged to be of good quality, one by Dishman et al. (1998) concluded that workplace physical activity interventions have a small, non-significant positive effect on physical activity or fitness, and the other, by Proper et al. (2003), concluded that evidence of a significant intervention effect was based on only two high quality studies, and that both of these reported that the methodological quality of the published literature was poor, with many authors also using only self-reported physical activity to measure outcomes. A more recent umbrella review by Proper (2007) covered five reviews of physical activity programmes and concluded: "Worksite health promotion programmes addressing physical activity and diet have been shown to be effective in changing behaviour (physical activity and diet) and health-related outcomes . . . Despite lack of methodologically sound studies using a randomised design that investigated the effectiveness of worksite physical activity and diet promotion programmes on work-related outcomes, there are indications that such programmes can yield decreased levels of absenteeism and presenteeism."

The current review found four meta-analyses of the effects of workplace interventions designed to increase physical activity and fitness. The first, Dishman et al., (1998), reported a small positive effect which was not statistically different from zero (i.e. no effect), but judged that the poor scientific quality of the literature precludes the judgment that

interventions cannot increase physical activity or fitness. The three meta-analyses since then (Conn et al. 2009; Abraham and Graham-Rowe 2009; Taylor et al. 2012) all found positive effective of such interventions on physical activity and also on fitness. The three meta-analyses find a similar effect size of between  $d = 0.21$  to  $0.23$ . Three of the five systematic reviews on these programmes (Proper et al. 2003; Dugdill et al. 2008; Vuillemin et al. 2011) conclude that workplace physical activity interventions can increase physical activity, while two judge the evidence to be inconclusive.<sup>2</sup>

The impact of physical activity interventions on employee weight and BMI is examined in one meta-analysis, Verweij et al. (2011), which finds a favourable effect on both employee weight and BMI, although it judges the quality of the evidence to be low on these health outcomes due to the small number of studies.

There is less evidence on the organisational or economic outcomes of physical activity interventions; this review did not find any meta-analyses of these programmes which examined these outcomes and found only two systematic reviews. Both studies investigated productivity, one finding no evidence of a positive effect (Proper et al., 2002) and the other finding inconsistent evidence (Pereira et al., 2015). One systematic review examined absenteeism, concluding that these interventions can reduce absenteeism while noting the limited nature of the studies (Proper et al., 2002). Finally, one found consistent evidence that physical activity interventions do not reduce sick leave (Pereira et al., 2015).

**Nutrition and Dietary Programmes:** This review found one meta-analysis (it examined health outcomes only) and three systematic reviews (examining dietary behaviour and health outcomes) on the effectiveness of workplace interventions specifically aiming to improve nutrition or dietary behaviour.

The two systematic reviews which examine healthy eating interventions or nutritional weight loss interventions both conclude there is moderate evidence of favourable effect. This is demonstrated either as an increase in fruit and vegetable intake (Ni Mhurchu, Aston and Jebb, 2010) or improved dietary behaviour (educational and multi-component nutritional interventions in Maes et al., 2012). One systematic review, Geaney et al. (2013), examines workplace dietary modification interventions (modified food preparation practices, changes in portion size or changes in the food choices) alone or in combination with nutrition education. It judged there to be limited evidence of a favourable effect on fruit and vegetable intake (favourable effect found in 4 of 6 studies).

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<sup>2</sup> One systematic review (To et al., 2013) examined effects on physical activity, steps and BMI but it did not draw any conclusions on overall effectiveness.

Health outcomes of workplace dietary behaviour interventions were covered in the meta-analysis by Verweij et al., (2011). It found insufficient studies to draw conclusions. Similarly, all of the systematic reviews above report that the evidence is inconclusive in relation to health outcomes such as weight or BMI.

**Weight Loss or Management Interventions:** The current review found one systematic review of weight management interventions. It focused on randomized trials of interventions, found a strong diversity of results between different interventions, and did not provide an overall conclusion on effectiveness.

## 2.2 SMOKING AND ALCOHOL CONSUMPTION

**Smoking cessation programmes:** There is strong evidence that worksite smoking cessation programmes have a favourable effect (two meta-analyses). One meta-analysis (Smedslund et al., 2002) found the effect was present after 6 and 12 month follow up but was not present after 12 months. Another meta-analysis (Cahill and Lancaster, 2014) found evidence of pooled effects for most interventions (e.g. individual and group counselling, pharmacological treatment to overcome nicotine addiction, and multiple interventions) but not all (e.g. self-help interventions). A systematic review by Leeks et al., (2010), concludes that worksite incentives and competitions to reduce tobacco use in combination with other interventions are effective.

A rapid review (Bell et al., 2007) for NICE assessed 32 studies on workplace interventions for smoking cessation including previous systematic reviews. It is consistent with the findings from this review. It concludes that the following smoking cessation interventions have been proven to be effective: brief interventions<sup>3</sup>; individual behavioural counselling; group behaviour therapy; pharmacotherapies; self-help materials; telephone counselling and quitlines.

**Alcohol interventions:** A systematic review of interventions to reduce alcohol problems<sup>4</sup> in the workplace revealed few methodologically adequate studies, but concludes that brief interventions, interventions contained within health and life-style checks, psychosocial skills training, and peer referral have *potential* to produce beneficial results (Webb et al., 2009). A systematic review of studies examining interventions for risky alcohol consumption among

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<sup>3</sup> Brief interventions for smoking cessation involve opportunistic advice, discussion, negotiation or encouragement and are delivered by a range of primary and community care professionals, typically within 5–10 minutes.

<sup>4</sup> Defined by the systematic review as (a) excessive alcohol use, (b) alcohol abuse or (c) alcohol problems.

workers in male-dominated industries concluded that evidence on specific interventions for alcohol use problems in male-dominated industries was limited, and that while there is evidence that some interventions are effective and some evidence that other interventions do not seem to work, overall the review is inconclusive on the effectiveness of interventions (Lee et al., 2014). The review draws a clear conclusion that interventions for alcohol use problems are feasible in the workplace, even within a culture that is typically ambivalent about addressing risky drinking.

### 2.3 STRESS, ANXIETY AND DEPRESSION

There is evidence that programmes addressing stress, anxiety or depression have a **favourable impact on health outcomes**. Studies in this category tend not to examine **health behaviours** and only a few examine **organisational benefits**.

Regarding positive **health outcomes**, there is **strong evidence** that *stress management programmes* have a favourable effect on **stress/distress** (three meta-analyses; one covering occupational stress management programmes, one covering psychoeducational programmes and one covering mindfulness-based interventions). There is **moderate evidence** that stress management interventions have a favourable effect on **anxiety and mental health** (one meta-analysis), and on physiological outcomes such as a **blood pressure or cholesterol** (one meta-analysis). There is **strong evidence** (four meta-analyses) that programmes to reduce *symptoms of anxiety and depression* in the general workforce (e.g. occupational stress management/reduction; mental health interventions using CBT; resilience building programmes) have a positive impact on **anxiety and depression symptoms**. Furthermore, there is **moderate evidence** that these programmes can facilitate **recovery from anxiety or depression** (one meta-analysis). Finally, there is **moderate evidence** (one meta-analysis) that these programmes can improve **wellbeing** (positive affect, purpose in life, subjective well-being) although the impact diminished over time except for programmes targeting individuals thought to be at greater risk of experiencing stress and lacking core protective factors.

Few meta-analyses or systematic reviews in this category have examined **organisational benefits**. There is **moderate evidence** that stress management programmes have a **positive effect on productivity** but **do not reduce absenteeism** (one meta-analysis). There is **moderate evidence** of a positive effect of resilience training on **supervisor's rating** and **successful task completion** (one meta-analysis) although the impact diminished over time except for programmes targeting individuals thought to be at greater risk of experiencing stress and lacking core protective factors.

PROGRAMMES	HEALTH BEHAVIOURS	HEALTH OUCOMES	ORGANISATIONAL OUTCOMES
<b>STRESS MANAGEMENT PROGRAMMES</b>	? <b>NO MA OR SR</b>	✓ <b>STRESS/DISTRESS</b> 3 OF 3 MAS ✓ <b>ANXIETY &amp; MENTAL HEALTH</b> 1 OF 1 MA ✓ <b>PHYSIOLOGICAL, E.G. BLOOD PRESSURE, CHOLESTEROL</b> 1 OF 1 MA	✓ <b>PRODUCTIVITY</b> 1 OF 1 MA × <b>ABSENTEEISM</b> 1 OF 1 MA
<b>ANXIETY &amp; DEPRESSION</b>	? <b>NO MA OR SR</b>	✓ <b>ANXIETY &amp; DEPRESSION</b> 4 OF 4 MAS ✓ <b>WELLBEING OUTCOMES</b> 1 OF 1 MA <sup>1</sup>	✓ <b>SUPERVISOR'S RATING</b> 1 OF 1 MA <sup>1</sup> ✓ <b>TASK COMPLETION</b> 1 OF 1 MA <sup>1</sup>
MA = meta-analysis, SR = systematic review. 1 Impact diminished over time except for programmes targeting individuals thought to be at greater risk of experiencing stress and lacking core protective factors.			

**Stress Management Programmes:** All of the three meta-analyses that examine the effectiveness of *universal* workplace interventions to reduce stress find an overall favourable effect. This includes reviews of interventions on occupational stress management programmes (OSMPs), mindfulness based stress reduction interventions (MBSRs) and psychoeducation. Effect sizes are described as ‘small’ for psychoeducation interventions (Van Daele et al., 2012) and ‘medium to large’ for OSMPs (Richardson and Rothstein, 2008) and MBSRs (Virgili, 2015).

These findings are consistent with a recent systematic meta-review (review of reviews) by Joyce et al. (2015) which appraises existing literature reviews on workplace interventions for common mental disorders using the AMSTAR assessment tool. It concludes there is strong evidence that CBT-based stress management interventions reduce stress.

In terms of *selective interventions*, i.e. for workers in high risk groups, favourable effects are reported for healthcare workers (in the two meta-analyses and the one systematic review found), and for teachers (reported as low to limited evidence in two systematic reviews). The systematic review for nurses judged it was not possible to form a conclusion. The systematic review for workers in the mental health field did not draw a conclusion. A systematic review which examined it for social workers indicated there was no evidence of an effect: this was based on one study.

**Anxiety and Depression Programmes:** Fenton et al. (2014) in their scoping review conclude: “The evidence base for interventions is on the whole inconclusive.” The current review



found a number of additional studies to those reviewed in Fenton et al. (2014), which suggest that the evidence is less inconclusive, and point to positive effect of interventions. These include studies examining interventions with a universal focus and those with a focus on workers with a diagnosis of depression or anxiety.

All four of the meta-analyses examining interventions with a *universal* focus found a favourable effect of interventions on symptoms of anxiety and depression. This included interventions with a particular focus on relaxation, meditation and cognitive behaviour skills training (Richardson and Rothstein, 2008; van der Klink et al. 2001; Tan et al., 2014) and resilience training (Vanhove et al., 2016).

With regard to workers with a *diagnosis* of depression or anxiety, a meta-analysis of mental health interventions (Joyce et al., 2016) found certain interventions prevent as well as facilitate recovery from depression and/or anxiety. The systematic review of prevention strategies for depression (Dietrich et al., 2012) found that the one study which met the inclusion criteria (diagnosis of depression with validated screening instruments and presence of a control group) had a positive effect. The findings of the current review are consistent with the recent meta-review by Joyce et al. (2015), mentioned earlier, which concludes: “Overall, these findings demonstrate there are empirically supported interventions that workplaces can utilize to aid in the prevention of common mental illness as well as facilitating the recovery of employees diagnosed with depression and/or anxiety”.

## 2.4 WORKPLACE HEALTH PROMOTION PROGRAMMES

Studies examining the effect of workplace health promotion programmes or multi-component programmes tend to focus on health and organisational outcomes rather than health behaviours. None of the meta-analyses in this category found for this Review focused on behaviour outcomes, and the evidence from systematic reviews is **inconclusive on health behaviours**.

There is evidence that workplace health promotion programmes result in **positive health outcomes**. There is **strong evidence** that they improve **mental wellbeing** (two meta-analyses), some evidence of a favourable effect on **self-perceived health** (one meta-analysis), but **moderate evidence** of **no effect on physical well-being** (one meta-analysis)<sup>5</sup>.

A greater percentage of studies of WHPP or multi-component programmes examine impacts on **organisational benefits**. There is **strong evidence** of a favourable effect on **sickness**

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<sup>5</sup> In the meta-analysis by Kuoppala et al. (2008) well-being is defined as an employee’s perception of his or her physical, psychological, and social well-being at large. Physical well-being was described by somatic symptoms, such as musculoskeletal discomfort or pain, and other physical symptoms.

**absences** (two meta-analyses) and **work ability** (two meta-analyses). There is also **moderate evidence** of positive impacts on different outcomes across a number of separate single meta-analyses namely, **job satisfaction**, **absenteeism**<sup>6</sup> and **productivity**.

PROGRAMMES	HEALTH BEHAVIOURS	HEALTH OUTCOMES	ORGANISATIONAL OUTCOMES
WHPP OR ORGANISATIONAL WELLNESS PROGRAMMES	? NO MA & 5 SRS <sup>1</sup>	✓ MENTAL WELLBEING 2 OF 2 MAS ✓ SELF-PERCEIVED HEALTH 1 OF 1 MA ✗ PHYSICAL WELL-BEING 1 OF 1 MA	✓ SICKNESS ABSENCES 2 OF 2 MAS ✓ WORK ABILITY 2 OF 2 MAS <sup>2</sup> ✓ ABSENTEEISM 1 OF 1 MA ✓ JOB SATISFACTION 1 OF 1 MA ✓ PRODUCTIVITY 1 OF 1 MA

MA = meta-analysis, SR = systematic review.

<sup>1</sup> Evidence on effectiveness from systematic reviews of WHPP on behaviour outcomes is generally inconclusive.

<sup>2</sup> One meta-analysis is based on two studies, and found the effect size was higher for the study rated as 'Poor/fair quality' 0.41 (0.04, 0.78) than the study rated 'Good/excellent quality' 0.10 (-0.14, 0.35).

A number of meta-analyses and systematic reviews examine the effectiveness of interventions labelled 'workplace health promotion programmes', 'worksite wellness programmes' or 'organisational wellness programmes'. These 'programmes' are loosely defined as workplace interventions that attempt to promote good health or to identify and correct potential health-related problems. Studies of these programmes include a wide range of interventions addressing physical activity, weight, nutrition and lifestyle.

Evidence on the effect of WHPP on health behaviour outcomes is generally inconclusive. It is not examined in any of the meta-analyses found, and the systematic review evidence is inconclusive. For physical activity, Aneni et al., (2014) found no effect while Engbers et al., (2008), and Oscilla et al., (2012) conclude the evidence to be inconclusive, while Soler et al., (2010) conclude it supports a positive effect. For dietary behaviour, Engbers et al., (2008) found an effect while Oscilla et al., (2012) and Aneni et al., (2014) judge the evidence to be inconclusive but Soler et al., (2010) conclude the evidence supports a favourable effect for dietary fat intake but is inconclusive for intake of fruits and vegetables. Oscilla et al., (2012),

<sup>6</sup> Absenteeism is often defined as 'voluntary non-attendance at work, without valid reason . . . not includ[ing] involuntary or occasional absence due to valid causes, or reasons beyond one's control, such as accidents or sickness' ([www.businessdictionary.com](http://www.businessdictionary.com)). The meta-analysis included studies with different measures of absenteeism as follows: involuntary (33), both voluntary plus involuntary (13), or not reported (20).

and Aneni et al., (2014) judge the evidence to be inconclusive for smoking cessation and Oscilla et al., (2012) judge the evidence to be inconclusive for alcohol use while Soler et al. (2010) judge the evidence to support an effect for both.

The two meta-analyses that examine outcomes for mental health report positive conclusions, with favourable pooled effect sizes found (Kuoppala et al., 2008 and Martin et al., 2009), although the one systematic review with mental health outcomes (Osilla et al., 2012) judges there were too few studies to form a conclusion (3 out of 4 studies reporting an effect). Favourable effects on self-perceived health are also reported in a meta-analysis (Rongen et al., 2013).

A meta-analysis did not report a favourable effect on physical well-being (Kuoppala et al., 2008). A favourable effect is reported on body weight by two systematic reviews (Benedict and Arterbrun, 2008; Groenevald et al., 2010), and on body fat by one review (Groenevald et al., 2010); a third systematic review concludes there is insufficient evidence to form a conclusion for body composition such as body weight or BMI (Soler et al., 2010). One systematic review reports a positive effect on blood pressure (Soler et al., 2010) while another reports mixed evidence (Groenevald et al., 2010). Mixed evidence is reported in systematic reviews in relation to other physiological outcomes – BMI (Benedict and Arterbrun, 2008), blood lipids and /or blood glucose (Groenevald et al., 2010).

The systematic review with sickness absence indicators is somewhat inconclusive. Odeen et al., (2013) conclude that active workplace interventions in general tend not to have an effect, but that certain interventions do have an effect. Nevertheless, producing pooled effect size estimates leads the authors of the two meta-analyses (Kuoppala et al., 2008, and Rongen et al., 2013) to conclude that WHPPs have a favourable effect on sickness absences.

Similarly, for absenteeism there are more conclusive judgements from the meta-analysis than from the systematic reviews. One systematic review concludes the evidence supports a positive effect (Soler et al., 2010) while another judges the evidence to be inconclusive (Osilla et al., 2012 found all four studies report a decrease but judges the number to be limited and therefore the evidence inconclusive). The meta-analysis (Parks and Steelman, 2008) finds a favourable pooled effect on absenteeism.

Meta-analyses also find favourable effects of WHPPs on work ability (Kuoppala et al., 2008 and Rongen et al., 2013), job satisfaction (Parks and Steelman, 2008) and productivity (Rongen et al., 2013).

## 2.5 KEY CHAPTER FINDINGS

### Workplace Well-being Programmes

This chapter sought to review the evidence on the effectiveness of workplace well-being programmes. The Review found there is not a single or neat definition of workplace well-being programmes. It also found an inconsistency in the reporting of interventions and outcomes. The basis for including studies for some reviews is the focus of the programme, for others it is the outcomes measured, and a small number confuse the two when reporting results.

Nevertheless, based on a review of the search terms and the inclusion and exclusion criteria of meta-analyses and systematic reviews, it is possible to categorise workplace wellness programmes according to their focus as follows:

- 1. Single or dual focus programmes:** These programmes tend to focus on one element such as physical activity or two elements such as physical activity and dietary behaviour. These programmes fall into three broad areas of (a) physical activity, dietary behaviour and weight management; (b) smoking and alcohol behaviours; (c) stress, anxiety and depression.
- 2. Multi-focus programmes:** Often called workplace health promotion programmes or worksite/organisational wellness programmes, these focus on a combination of physical activity, weight, nutrition and physical activity, stress management and anxiety/depression, and lifestyle interventions.

A number of systematic reviews and meta-analyses examine the effectiveness of the above programmes, looking at measures of health behaviour and outcomes measures for health and economic or organisational issues. Most of the evidence from meta-analysis is on health outcomes followed by organisational outcomes, and finally health behaviours.

### Impacts on Health Behaviours, Health and Organisational Outcomes

The table overleaf summarises the conclusions of the literature reviewed on the effectiveness of workplace wellbeing programmes.

There is **strong evidence** of an impact on **physical activity** and **fitness** from participation in physical activity programmes, and **moderate evidence** of an impact on **physical activity** by participation in programmes focusing on physical activity *and* nutrition together. There is **strong evidence** of an impact on **smoking** from participation in smoking cessation programmes. There is **some evidence** of a favourable impact on **fruit and vegetable intake** and **dietary behaviour** resulting from participation in nutrition and dietary programmes. The

Review did not find meta-analyses that examine the impact on health behaviours of participation in weight loss or management programmes, stress management programmes, programmes aimed at anxiety and depression, or workplace health promotion programmes.

There is **strong evidence** of a favourable effect on **body weight** and **BMI** due to participation in physical activity *and* nutrition programmes, and **moderate evidence** of a favourable effect on these outcomes for programmes that focus on physical activity alone. There is also **moderate evidence** of a favourable effect on **body fat percentage** due to participation in physical activity *and* nutrition programmes and on other physiological measures such as **blood pressure or cholesterol** by stress management programmes. There is **moderate evidence** that there is not a favourable effect on physical well-being from multi-focus or workplace health promotion programmes.

There is **strong evidence** of a favourable effect on **mental health** from workplace health promotion programmes, on **stress/distress** from stress management programmes, and on **anxiety and depression** from programmes focusing on these conditions. There is also **moderate evidence** that the latter programmes have favourable impacts on **wellbeing measures** such as positive affect, purpose in life, and subjective well-being.

Much of the evidence on organisational outcomes is from workplace health promotion programmes. There is **strong evidence** of a favourable effect of participation in workplace health promotion programmes on **workability** and **sickness absences**. There is **moderate evidence** of a favourable effect on **productivity, job satisfaction, and absenteeism**.

Some of the evidence on other programmes also finds favourable effects on the above outcomes. There is **moderate evidence** of a favourable effect on productivity from stress management programmes, on work attendance from physical activity programmes, and of resilience training on task completion and supervisors' rating from programmes focusing on anxiety and depression. However, this is not the case for all programmes. A favourable effect was not reported on absenteeism for stress management programmes, or on sick leave for physical activity programmes.

HEALTH BEHAVIOURS	HEALTH OUTCOMES	ORGANISATIONAL OUTCOMES
✓ <b>PHYSICAL ACTIVITY &amp; FITNESS (PAP)</b>	✓ <b>WEIGHT &amp; BMI (PANP)</b>	✓ <b>WORK ABILITY<sup>4</sup> (WHPP)</b>
✓ <b>SMOKING (SCP)<sup>5</sup></b>	✓ <b>WEIGHT &amp; BMI<sup>2</sup> (PAP)</b>	✓ <b>TASK COMPLETION<sup>3</sup> (ADP)</b>
✓ <b>PHYSICAL ACTIVITY<sup>1</sup> (PANP)</b>	✓ <b>BODY FAT % (PANP)</b>	✓ <b>SUPERVISOR'S RATING<sup>3</sup> (ADP)</b>
✓ <b>FRUIT &amp; VEG. (NDP)</b>	✓ <b>PHYSIOLOGICAL, E.G. BLOOD PRESSURE, CHOLESTEROL (SMP)</b>	✓ <b>JOB SATISFACTION (WHPP)</b>
✓ <b>DIETARY (NDP)</b>	✗ <b>PHYSICAL WELL-BEING (WHPP)</b>	✓ <b>PRODUCTIVITY (WHPP)</b>
~ <b>ALCOHOL CON. (ARP)</b>	✓ <b>MENTAL WELLBEING (WHPP)</b>	✓ <b>PRODUCTIVITY (SMP)</b>
? <b>NO MA OR SRs (WLM)</b>	✓ <b>STRESS/DISTRESS (SMP)</b>	✓ <b>SICKNESS ABSENCES (WHPP)</b>
? <b>NO MA OR SR (SMP)</b>	✓ <b>STRESS (PAP)</b>	✗ <b>SICK LEAVE (PAP)</b>
? <b>NO MA OR SR (ADP)</b>	✓ <b>ANXIETY &amp; DEPRESSION (ADP)</b>	✓ <b>ABSENTEEISM (WHPP)</b>
? <b>NO MA &amp; 5 SRs (WHPP)</b>	✓ <b>ANXIETY (PAP)</b>	✗ <b>ABSENTEEISM (SMP)</b>
	✓ <b>ANXIETY &amp; M. HEALTH (SMP)</b>	✓ <b>WORK ATTENDANCE (PAP)</b>
	✓ <b>WELLBEING<sup>3</sup> (ADP)</b>	~ <b>VARIOUS MEASURES (NDP)</b>
	✓ <b>SELF-PERCEIVED HEALTH (WHPP)</b>	? <b>NO MA OR SR (PANP)</b>
	~ <b>VARIOUS MEASURES (NDP)</b>	? <b>NO MA OR SR (WLM)</b>
	? <b>NO MA &amp; 1SR (WLM)</b>	

MA = meta-analysis, SR = systematic review.

*Programme Abbreviations:*

PANP = Physical Activity *and* Nutrition Programmes; PAP = Physical Activity Programmes; NDP = Nutrition and Dietary Programmes; WLM = Weight loss or management; SMP = Stress Management Programmes; A&DP = Anxiety and Depression Programmes; WHPP = Workplace Health Promotion Programmes; SCP = Smoking Cessation Programmes; ARP = Alcohol Reduction Programmes.

*Degree of evidence:*

**Blue:** strong evidence, conclusion of at least two meta-analyses

**Orange:** moderate evidence, conclusion of the one meta-analysis found

**Grey:** some evidence, conclusion of the systematic review(s) found

<sup>1</sup> Reported as limited evidence for educational only interventions. <sup>2</sup> Reported as low quality evidence.

<sup>3</sup> Programme effects diminish over time. <sup>4</sup> One meta-analysis is based on two studies, and found the effect size was higher for the study rated as 'Poor/fair quality' 0.41 (0.04, 0.78) than the study rated 'Good/excellent quality' 0.10 (-0.14, 0.35). <sup>5</sup> In one meta-analysis the pooled effect was present at 6 and 12 months but was not present after 12 months. In the other meta-analysis there was a pooled effect for most but not all SCP intervention types.

### 3. ARE WORKPLACE WELLBEING PROGRAMMES WORTH THE INVESTMENT?

#### 3.1 OVERVIEW

In practice, how one decides whether workplace wellbeing programmes are worth the investment depends on one's perspective, as it influences the lens through which interventions are viewed and the basis upon which judgements are made. For example, an employer facing a tight labour market might view workplace wellbeing programmes as being worth the investment if they facilitate hiring and retention. An organisation trying to maximise return might view them as being worth the investment if they help improve worker performance and costs. On the other hand, a public health worker might view workplace wellbeing programmes as one of a number of positive tools to help improve health, and therefore worth the investment.

Traditional public policy analysis uses cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA) to help form a conclusion. CBA expresses both the effects and costs of interventions in monetary terms, and judges an intervention to be worth the investment if the benefits exceed the costs. In CEA the effects are expressed in a common non-monetary measure while costs are expressed in monetary terms, and it judges an intervention to be worth the investment if the difference in cost between interventions, divided by the difference in their effect (the incremental cost effectiveness ratio), is less than a threshold monetary value (ICER < threshold). This report found a smaller number of reviews of CBA and CEA than reviews of effectiveness. The findings are discussed in the following sections.

#### 3.2 PHYSICAL ACTIVITY AND NUTRITION PROGRAMMES

There is **some evidence** (one systematic review) that the **financial returns** from these programmes are positive overall (net benefit = \$91, benefit to cost ratio = 1.42, return on investment = 42%). However, this conclusion does not hold when the evidence is restricted to randomised controlled studies (RCTs). This may be because the follow-up period in these studies is shorter (resulting in lower financial return estimates) than in the non-randomised studies. This, together with the fact that additional types of benefits associated with the programmes have not been captured in both RCT and non-randomised studies, leads authors to argue that the existing evidence does not support definitive conclusions about the overall financial returns of these programmes.

It is also **not possible** to judge the **cost-effectiveness** of these programmes. While the evidence suggests the programmes are more effective and more costly than usual care, there are no established thresholds against which to compare the extra outcome per extra

cost. For instance, it is unknown how much decision makers are willing to pay for reduced body weight, cholesterol levels and cardiovascular risks.

PROGRAMMES	FINANCIAL RETURNS	COST EFFECTIVENESS/UTILITY
PHYSICAL ACTIVITY &/ NUTRITION	~ INCONCLUSIVE/INS. STUDIES (1 SR)  AVERAGE +VE F. RETURNS NB = \$91, BCR = 1.42, ROI = 42%  <b>BUT:</b>  F. RETURNS NOT +VE IN RCTS FOLLOW-UP SHORTER IN RCTS NOT ALL BENEFITS COUNTED <sup>1</sup>	? UNKOWN (1 SR)  EVIDENCE OF BETTER OUTCOMES AT HIGHER COST BUT NO ESTABLISHED "WILLINGNESS TO PAY" THRESHOLDS TO COMPARE AGAINST
SR = systematic review. <sup>1</sup> Benefits covered in studies were medical, absenteeism, and presenteeism.		

**Financial Returns:** Summarising the evidence from 18 studies<sup>7</sup> of programmes aiming to improve nutrition and/or increasing physical activity, van Dongen et al., (2011) found:

- ✓ median annual programme costs per participant of \$155 (n = 21) median annual benefits per participant of \$324 (n = 15) for absenteeism, \$187 (n = 13) for medical benefits and \$158 (n = 3) for presenteeism.
- ✓ positive financial return in 14 out of 21 interventions, i.e. net benefit (NB) > 0, benefit to cost ratio (BCR) > 1 and return on investment (ROI) > 0). The median NB was \$91 (n = 21), the median BCR was 1.42, and median ROI was 42%.

Van Dongen et al., (2011) comment:

“On average, the financial return in terms of absenteeism benefits, medical benefits or both were positive during the first years after implementation. This is in accordance with previous reviews concluding that WHP programmes should be considered as an effective method for reducing employee-related expenses and producing positive financial returns in terms of absenteeism and medical benefits.”

When they undertake a subgroup analysis by type of study design, they find: “Worksite health promotion programmes aimed at improving nutrition and/or increasing physical activity generate financial savings in terms of reduced absenteeism costs, medical costs or

<sup>7</sup> They included four randomized controlled trials (RCTs), 13 non-randomized studies (NRSs) and one modelling study published up to 14 January 2011.



both according to NRSs [13 non-randomized studies], whereas they do not according to RCTs [4 randomized controlled trials].”

Table 3.1 shows that both ROI and BCR were positive for non-randomized studies, but negative for RCTs.

**Table 3-1: Average financial return estimates overall and by study design**

	Return on investment (ROI)			Benefit to cost ratio (BCR)		
	All	NRS	RCT	All	NRS	RCT
Absenteeism benefits	200%	325%	-49%	3	4.25	0.51
Medical benefits	22%	95%	-112%	1.22	1.95	-0.12
Both	174%	387%	-92%	2.74	4.87	0.08

Van Dongen et al., (2011) note that “These findings also support researchers arguing that the cost savings and high ROI estimates found in WHP studies are likely the result of selection bias”. However, one cannot infer that differences are purely due to study design as other differences exist between the particular NRS and RCTs. For example, the follow-up duration of NRSs was, on average, longer than that of RCTs. They note that

“Since WHP programme costs are more costly at the start while health benefits accumulate gradually, this may have resulted in lower financial return estimates in the RCTs. Therefore, conclusions about the extent to which financial return estimates were overestimated in NRSs cannot be made.”

Overall, van Dongen et al., (2011) conclude that “Since these programmes are associated with additional types of benefits, conclusions about their overall profitability cannot be made.” They argue for more ROI analyses based on RCTs, which include a consensus-based set of financial benefits.

**Cost-effectiveness:** In a separate study, van Dongen et al. (2012) undertook a systematic review on the cost-effectiveness of worksite physical activity and/or nutrition programmes. They found ten relevant studies covering 18 programmes.

They found that *worksite physical activity and nutrition programs* (N=6) were, from various perspectives, more costly and more effective in reducing body weight than usual care. For example, in relevant studies (N=3) the additional costs per kilogram of weight loss were:

- \$26 when only intervention costs were considered;

- \$75 and \$1,534 when analyses were performed from the employer's perspective;
- \$174, \$20, and \$1,282 when analyses performed from the societal perspective.<sup>8</sup>

Examining other outcome indicators they found most programmes (N=5/6) were more costly (intervention costs) and more effective than usual care in reducing cholesterol level and cardiovascular disease risks, and one intervention was more costly and more effective in reducing waist circumference.

In terms of *worksite nutrition programmes* only, the authors found that from various perspectives, these programmes (N=6) were more costly and more effective in reducing body weight than usual care. For example, in the pertinent studies (N=2), the additional costs per kilogram of weight loss were \$43 and \$20 when only intervention costs were considered. Most worksite nutrition programmes (N=4/5) were more costly (intervention costs) and more effective in reducing cholesterol level and cardiovascular disease risks.

Van Dongen et al. (2012) found that cost-effectiveness analysis was also conducted in terms of various other outcome measures (e.g. dietary habits, quality of life, physical activity-related outcome measures, and work-related outcome measures). However, incremental cost-effectiveness ratios (ICER), i.e. the difference in cost between the two possible interventions divided by the difference in their effect, was only calculated for one intervention.

With regard to cost-utility analysis, van Dongen et al. (2012) found only one relevant study. It examined an internet- and a phone-based nutrition and physical activity programme, and analyses were conducted from the societal perspective. After 24 months, the cost-utility of the internet-based intervention was \$1,698 per quality adjusted life year (QALY) gained and that of the phone based intervention \$311,523 per QALY gained.

When compared to the National Institute for Health and Clinical Excellence (NICE) threshold of £20,000 (\$30,500) to £30,000 (\$45,700) per QALY gained as well as the frequently cited US threshold of \$50,000–100,000 per QALY gained, the internet-based intervention of the

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<sup>8</sup> The paper does not define the above costs term. One may assume that the intervention cost is the cost of the intervention (e.g. trainer/provider costs), costs from employer's perspective include all costs for the employer (e.g. intervention costs plus opportunity cost of staff time), and a societal perspective includes all changes in resource use caused by an intervention. For instance, the U.S. Public Health Service's Panel on Cost-Effectiveness in Health and Medicine recommends that cost-effectiveness analyses (CEAs) intended to help allocate health resources in the public interest include a reference case analysis, conducted from the perspective of society as a whole. That is estimating all gains and losses or calculations that reflect the safety, effectiveness, and side effects of an intervention as well as its costs (Russell, Fryback, and Sonnenberg, 1999).

study can be regarded as cost-effective (\$1,698 per QALY gained), whereas the phone-based intervention (\$311,523 per QALY gained) cannot.

Overall they conclude that

“The cost-effectiveness of more costly and more effective programs depends on the ‘willingness to pay’ for their effects. It is unknown [there are no established levels] how much decision-makers are willing to pay for reductions in body weight, cholesterol level, and cardiovascular disease risks. Therefore, conclusions about the cost-effectiveness of worksite physical activity and/or nutrition programs cannot be made” and as such “it is up to individual decision-makers to judge whether or not these programs offer value for money.”

van Dongen et al. (2012) also note that

“Most of the included studies had several methodological shortcomings, which hinders the validity of their results. Therefore, there is substantial need for improvement of the methodological quality of studies evaluating the cost-effectiveness of worksite physical activity and/or nutrition programs and particular emphasis should be placed on the handling of uncertainty.”

### 3.3 MENTAL HEALTH PROGRAMMES

There is less evidence in relation to financial returns and cost-effectiveness of programmes aiming to specifically improve mental health. There is some evidence in favour of a positive financial return, but reviews strike a note of caution given the level of evidence available. One systematic review points to insufficient studies on financial returns and cost-effectiveness, and a more recent systematic review points to favourable evidence of financial returns (9 out of 10 studies) but indicates caution is required in interpreting the results, given the limited amount of evidence.

PROGRAMMES	FINANCIAL RETURNS	COST EFFECTIVENESS/UTILITY
<b>PROMOTING MENTAL HEALTH</b>	✓ ECONOMIC RETURNS <sup>1</sup> 1 OF 2 SR	? <b>UNKNOWN (2 SRs)</b> NO STUDIES
SR = systematic review. <sup>1</sup> Most of these studies looked solely at the impacts for employers, either in terms of paying for the health care of their employees or dealing with absenteeism and poor performance at work.		

**Financial Returns:** Boyd, Hunt, and Ortiz (2009a) undertook, for NICE, a systematic review of economic evaluations (cost-benefit analysis, cost-effectiveness, and cost-utility) of workplace-based interventions that promote mental wellbeing in working adults who experience stress, anxiety or depression at work. Only two studies met their inclusion criteria.<sup>9</sup> Boyd, Hunt, and Ortiz (2009a) found that both studies provided evidence of the positive net economic benefits of multi-component workplace health promotion programmes. They note that, conducted from the perspective of the employer, the studies also supported the business case for investing in such programmes, although it was not possible to isolate the precise contribution of the programmes to reductions in stress, anxiety or depression in participating employees.

In a separate modelling study, Boyd, Hunt, and Ortiz (2009b) conclude:

“The results of the economic modelling support the business case for implementing work-site interventions to promote the mental wellbeing of employees [but] . . . the evidence statements [resulting from their modelling] should only be viewed as indicative, and the underlying uncertainty should be taken into account when developing guidelines to promote the mental wellbeing of employees in the workplace.” The evidence statements resulting from their modelling exercise are presented in Appendix A.

McDaid and Park (2011) conducted a systematic review of 47 studies to determine the extent to which an economic case has been made in high-income countries for investment in interventions to promote mental health and well-being.<sup>10</sup> They find that nine of the ten

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<sup>9</sup> They undertook a systematic search of three economic databases (NHS EED, HEED and Econlit) which resulted in a total of 118 potentially relevant studies, and a further 22 studies were found that contained potentially relevant economic evidence. These included studies of multi-faceted workplace health promotion programmes that contain a component to explicitly address the mental wellbeing of employees. They reviewed 50 full papers and excluded 48 after applying the ex/inclusion criteria. In each of the two remaining studies, the multi-component programmes involved contained a component that explicitly addressed stress management at work. The two studies were from the USA from the early 1990s. The economic analysis in each study was based on observational data, with health outcomes assessed using health-risk assessment surveys.

<sup>10</sup> They focused on areas of interest to the DataPrev project: early years and parenting interventions, actions set in schools and *workplaces* and measures targeted at older people. Economic evaluations had to have some focus on promotion of mental health and well-being and/or primary prevention of poor mental health through health-related means. Studies preventing exacerbations in existing mental health problems were excluded, with the exception of support for parents with mental health problems, which might indirectly affect the mental health of their children. They note there was considerable variability in the quality of studies, with a variety of outcome measures and different perspectives: societal, public purse, employer or health system used, making policy comparisons difficult. They note much of the existing economic literature was beyond the scope of the review as it focused on actions targeted at the prevention of further deterioration, as well as the

economic analyses set in the workplace reported favourable outcomes. Most of these studies looked solely at the impacts for employers, either in terms of paying for the health care of their employees or dealing with absenteeism and poor performance at work. The text box below highlights some of the studies discussed.

The Johnson and Johnson wellness programme, which includes stress management, has been associated with a reduction in health-care costs of \$225 per employee per annum (Ozminkowski et al., 2002). It did not report specific impacts on mental well-being or stress.

A 4-year analysis of the Highmark company wellness programme, including stress management classes and online stress management advice, reported a return on every \$1 invested of \$1.65 when looking at the impact on health-care costs (Naydeck et al., 2008). It did not report specific impacts on mental well-being or stress.

An intervention to help cope with stress in the computer industry did not find any significant difference in stress levels, but it was associated with a reduction in overall reported illness and a one-third decrease in the use of health-care services which would more than cover the costs of the intervention (Rahe et al., 2002).

A study on a multi-component workplace-based health promotion programme study design, found, using pre-post tests, significantly reduced health risks, including work-related stress and depression, reduced absenteeism and improved workplace performance. The cost of the intervention to the company was £70 per employee; there was a 6-fold return on investment due to a reduction in absenteeism and improvements in productivity (Mills et al., 2007).

A health promotion scheme over 3 years was compared with matched controls. Overall levels of risk to health were significantly reduced, while there was also a significant reduction in the prevalence of depression, although rates of anxiety significantly increased. It was reported that there were net cost savings from a health-care payer perspective, although the costs of participation in the health promotion programme were not reported (Loeppke et al., 2008).

An uncontrolled evaluation of a comprehensive work place health promotion programme reported a significant reduction in stress levels, signs of stress and feelings of depression at the end of a 3-year study period. Costs of the programme were not reported but staff turnover and absenteeism decreased substantially (Renaud et al., 2008).

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alleviation of problems in people already identified as having clinical threshold levels of mental disorder.

A small controlled study looking at a programme to prevent stress and poor health in correctional officers working in a youth detention facility in the USA reported incremental cost savings of more than \$1000 over 3 months, although the sample size was too small to be significant (McCraty et al., 2009).

McDaid and Park (2011) conclude:

“Caution must therefore be exercised in interpreting results, but the case for investment in parenting and health visitor-related programmes appears most strong, especially when impacts beyond the health sector are taken into account. In the workplace an economic return on investment in a number of comprehensive workplace health promotion programmes and stress management projects (largely in the USA) was reported, while group-based exercise and psychosocial interventions are of potential benefit to older people. . . . Many gaps remain; a key first step would be to make more use of the existing evidence base on effectiveness and model mid- to long-term costs and benefits of action in different contexts and settings.”

**Cost-effectiveness:** Boyd, Hunt, and Ortiz (2009a) note that neither of the studies that met their inclusion criteria used QALYs to measure the health outcomes. Similarly, McDaid and Park (2011) note that no studies reported benefits in terms of QALYS.

### 3.4 WORKPLACE HEALTH PROMOTION PROGRAMMES

There is a similar lack of studies examining the cost-effectiveness of workplace health promotion programmes, but there is moderate evidence that they are associated with lower levels of absenteeism costs and health care costs (1 meta-analysis and 1 systematic review), and moderate evidence (1 meta-analysis) that multi-component health promotion programmes result in favourable financial returns in terms of lower worker health care costs, sick leave, workers’ compensation costs and disability management claims cost, and a positive benefit to cost ratio.

PROGRAMMES	FINANCIAL RETURNS	COST EFFECTIVENESS/UTILITY
SINGLE/MULTIPLE FOCUS OR MULTI-COMPONENT	✓ FINANCIAL RETURNS 1 OF 1 MA AND 2 OF 2 SRs	? UNKOWN (3 SRs) NO STUDIES
MA = meta-analysis, SR = systematic review.		

**Financial Returns:** Based on a review of 72 studies, Aldana (2001) concludes that “health promotion programmes are associated with lower levels of absenteeism and lower health care costs, and fitness programmes are associated with reduced health care costs.”

A meta-analysis by Baicker, Cutler, and Song (2010) calculated:<sup>11</sup>

- ✓ A ROI of \$3.27 for medical cost savings, i.e. on average, employee healthcare costs fell by \$3.27 for every dollar spent on wellness programmes.
- ✓ A ROI of \$2.73 for absenteeism reduction, i.e. on average, absentee day costs fell by \$2.73 for every dollar spent on wellness programmes.

Chapman (2012) undertook a meta-evaluation of *worksite multicomponent health promotion programmes* in 62 economic return studies.<sup>12</sup> Chapman (2012) concludes:

"This 2012 meta-evaluation update provides a systematic look at the quality and summary results of the literature on the financial impact of workplace health promotion programs. The summary evidence continues to be strong with average reductions in sick leave, health plan costs, and workers' compensation and disability insurance costs of around 25%. . . . Based on these published results, it is reasonable to conclude that worksite health promotion represents one of the most effective strategies for reducing medical costs and absenteeism."

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<sup>11</sup> They included studies with experimental or quasi-experimental designs; 22 include health plan cost savings and 22 examine sick leave absenteeism savings, some studies include both.

<sup>12</sup> Articles had to report on programs that include any combination of a minimum of three of the following types of program interventions: smoking prevention and cessation, physical fitness, nutrition, stress management, medical self-care, high blood pressure control, cholesterol reduction, cardiovascular disease prevention, prenatal care, seat belt use, back injury prevention, back pain prevention, weight management, and nutrition education. Qualifying articles also had to include an experimental or observational period that is a minimum of 12 months in duration and had to evaluate one or more economic variables associated with working populations or characteristics of organizational life as part of the evaluation design and measurement strategy. This typically includes any one or combination of health benefit plan costs (including health care utilization indicators), sick leave absenteeism, workers' compensation costs, disability insurance and management costs, pension effects, and/or presenteeism effects. The report updates previous studies undertaken in 2003 and 2005.

**Table 3-2: Reported Economics Variables for Multi-component WHP Programmes**

Measure	Average value (unweighted)
% Change in Sick Leave Absenteeism	-25.1% (26 studies)
% Change in Health Costs	-24.5% (32 studies)
% Change in WC/DM Costs <sup>1</sup>	-32% (7 studies)
Cost-Benefit Ratio Reported	5.56 (25 studies)
<p>Notes:</p> <p>These figures are based on the percentage change in the value of the economic variables, based on changes associated with the groups receiving the most intensive intervention for the longest observational time period cited in the study. “This approach probably produces a “best-case scenario” result, and allows results to be reported in a succinct format. There is significant variation in the measurement methodology used in the various studies, even when a common economic variable such as sick leave absenteeism is used. The greatest inconsistency was in how health plan costs were measured. Despite these methodological inconsistencies, there was strong consistency in the direction and magnitude of changes produced by programs.”</p> <p>Later in the article Chapman (2012) notes that forty-four studies (70.9%) examined the savings limited to a single economic variable, and many of these, in arriving at a return-on-investment (ROI) calculation, divide this savings by the entire program cost; as a consequence, total economic impact and return are likely to be understated. The ideal would be for each study to examine health plan cost, sick leave cost, workers’ compensation cost, disability management, and presenteeism cost effects. He comments that “This approach to economic return would likely provide a more realistic assessment of the economic return associated with worksite health promotion and wellness programs and would tend to make health promotion and wellness more of a strategic business issue.”</p> <p><sup>1</sup> WC/DM refers to workers’ compensation costs and disability management claims cost.</p>	
<p><b>Source: Chapman (2012)</b></p>	

Chapman (2012) points out that more recent studies report larger average effects and higher cost-benefit yields than the earlier ones. He judges that recent studies:

- have better study methodology (of the 10 highest scoring studies in the meta-evaluation, only one was published before 1990, and six were published after 2000), and
- use newer prevention technologies<sup>13</sup> which are associated with higher levels of economic impact and return (their use in the studies that have been published in the past 10 years has resulted in slightly more than double the average cost-benefit ratio reported in studies of traditional program models; in other words, instead of the typical 1:3 cost-benefit ratio, they report 1:6).

<sup>13</sup> These include the Transtheoretical Model™, Internet-provided health information, tailoring, benefits-linked financial incentives, telephonic high risk intervention coaching, self-directed change, and annual required morbidity-based health risk appraisals used for individual targeting of interventions.



**Cost-effectiveness:** None of the studies found in the review provided data on the cost-effectiveness of workplace health promotion programmes.

### 3.5 KEY CHAPTER FINDINGS

#### Financial Returns

**Nutrition and/or increasing physical activity programmes:** there is **some evidence** (one systematic review) that the financial returns from worksite programmes aimed at improving are positive overall (NB = \$91, BCR = 1.42, ROI = 42%), but this does not hold when the evidence is restricted to randomised controlled studies (RCTs). This may be because the follow-up period in the particular RCTs is shorter (resulting in lower financial return estimates) than in the non-randomised studies. This, together with the fact that additional types of benefits associated with the programmes have not been captured in the studies, means that conclusions about their overall financial returns cannot be made.

**Mental health programmes:** there is **insufficient evidence** on financial returns, with one systematic review concluding there is insufficient evidence to conclude, while a more recent systematic review points to favourable evidence (9 out of 10 studies). However, it indicates caution is required in interpreting the results, given the limited amount of evidence.

**Health promotion programmes:** there is **moderate evidence** (1 meta-analysis) of favourable financial returns in terms of lower worker health care costs, sick leave, and workers' compensation costs and disability management claims cost, and a positive benefit to cost ratio.

#### Cost-effectiveness

It is generally **not possible to conclude on the cost-effectiveness** of workplace wellbeing programmes as, while the evidence suggests they are more effective and more costly, there are no established thresholds to compare the extra outcome per extra cost against. That is, it is unknown how much decision makers are willing to pay for improvements in the typical outcome indicators (such as reduced body weight, cholesterol levels and reduced cardiovascular risks) and the vast majority of studies do not compute QALYs for which thresholds are available.

PROGRAMMES	FINANCIAL RETURNS	COST EFFECTIVENESS/UTILITY
<b>PHYSICAL ACTIVITY &amp;/ NUTRITION</b>	<p>~ <b>INCONCLUSIVE/INS. STUDIES (1 SR)</b></p> <p><b>AVERAGE +VE F. RETURNS</b></p> <p>NB = \$91, BCR = 1.42, ROI = 42%</p> <p><b>BUT:</b></p> <p>F. RETURNS NOT +VE IN RCTS FOLLOW-UP SHORTER IN RCTS NOT ALL BENEFITS COUNTED<sup>1</sup></p>	<p>? <b>UNKNOWN (1 SR)</b></p> <p>EVIDENCE OF BETTER OUTCOMES AT HIGHER COST BUT NO ESTABLISHED “WILLINGNESS TO PAY” THRESHOLDS TO COMPARE AGAINST</p>
<b>PROMOTING MENTAL HEALTH</b>	<p>✓ <b>ECONOMIC RETURNS<sup>2</sup></b></p> <p>1 OF 2 SR</p>	<p>? <b>UNKNOWN (2 SRs)</b></p> <p>NO STUDIES REPORT CE MEASURES</p>
<b>SINGLE/MULTIPLE FOCUS OR MULTI-COMPONENT</b>	<p>✓ <b>FINANCIAL RETURNS</b></p> <p>1 OF 1 MA AND 2 OF 2 SRs</p>	<p>? <b>UNKNOWN (3 SRs)</b></p> <p>NO STUDIES REPORT CE MEASURES</p>

MA = meta-analysis, SR = systematic review.

<sup>1</sup> Benefits covered in studies were medical, absenteeism, and presenteeism. <sup>2</sup> Most of these studies looked solely at the impacts for employers, either in terms of paying for the health care of their employees or dealing with absenteeism and poor performance at work.

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## APPENDIX A: TABULAR SUMMARY OF THE EFFECTIVENESS OF PROGRAMMES

The Review uses a standardised summary “effectiveness table” to capture the conclusions of previous systematic reviews and meta-analyses and the symbols used are explained below.

### Symbols used in summary tables to reflect conclusions of other reviews

v	=	The study indicates the intervention is effective, the intervention has an effect on the behaviour(s) or outcome(s) of interest in the desired direction (hereafter favourable effect). For example, in the case of systematic reviews, the study indicates the majority of the studies examined report favourable effect, and in the case of meta-analysis a positive pooled effect is found.
x	=	The study indicates the intervention <i>is not</i> effective, the intervention does not have an effect on the behaviour(s) or outcome(s) of interest in the desired direction (hereafter no favourable effect). For example, in the case of systematic reviews, the study indicates the majority of the studies examined report no favourable effect, and in the case of meta-analysis, the study does not find a positive pooled effect.
~	=	The evidence on the effectiveness of the intervention is inconclusive. For example, in the case of a systematic review, half of the studies found a positive effect and half found no positive effect, or the quality of the evidence on the effectiveness of the intervention is of insufficient quality, or the number of studies is of insufficient upon which to base a judgement on the effect or otherwise of the intervention.
?	=	The outcome is not measured in any studies in a review.
.	=	A conclusion is not provided.
Yes	=	The purpose of the research was not to find favourable effect <i>per se</i> , but to test that the intervention did not have a unfavourable effect on an outcome (in line with the “do no harm principle”).

**A-1: Effective for Physical Activity, Dietary Behaviour and Weight Management? Summary of Conclusions in the Literature**

**Physical activity *and* dietary programmes**

Intervention	Outcomes focus	Effective?	Summary sentence	Study T.	Author
Universal					
Nutrition and/or physical activity programs to promote healthy weight (includes combined)	Weight BMI	√ √	Favourable effect, pooled effect of – 2.8 pounds. Favourable effect, pooled effect of – 0.5 BMI. The findings appear to be applicable to both male and female employees, across a range of worksite settings.	Meta-A	Anderson et al. (2009)
Physical activity <i>and</i> dietary behaviour	Weight BMI Body fat % Waist circumference Waist–hip ratio	√ √ √ √ ~	Favourable effects, MD -1.19 kg, moderate quality. Favourable effects, MD -0.34 kg m-2, moderate quality. Favourable effects, MD -1.12% SSF, moderate quality. Favourable effects, MD -1.08 cm, low quality. No conclusion as only one study.	Meta-A	Verweij et al., (2011)
Physical activity or nutrition	Various	√	Successful in achieving small improvements in health behaviours.	Meta-A	Hutchinson and Wilson (2012)
Nutrition and physical activity interventions  <i>European countries</i>	Anthropometrical Dietary behaviour Physical activity  Potential determinants of dietary/physical behaviour	~ ~ √ or ~ ~	Inconclusive evidence. Inconclusive evidence. Limited evidence for educational only interventions and inconclusive for multi-component only interventions. Inconclusive evidence.	Syst-R	Maes (2012)
Selective					
Diet and/or physical activity interventions  <i>Healthcare professionals</i>	Weight  Others^	~ ~	Pooled effect of -3.95 Kg up to 12 months, but insufficient studies. Insufficient studies/data. ^ BMI, body fat percentage, waist circumference, waist-hip ratio or diet and physical activity related outcomes	Syst-R and Meta-A	Power et al. (2014)

## Physical activity programmes

Intervention	Outcomes focus	Effective?	Summary sentence	Study T.	Author
Physical activity outcome measures					
Worksite interventions for increasing physical activity or fitness	Physical activity and fitness	~	A small positive effect, which is not statistically different from zero (i.e. no effect) poor scientific quality of the literature precludes the judgment that interventions cannot increase PA or PF.	Meta-A	Dishman et al. (1998)
Workplace physical activity interventions	PA behaviour Fitness Lipids Anthropometric meas. Work attendance Job stress	√ √ √ √ √ √	Favourable effect, small effect size d = 0.21. Favourable effect, medium effect size d = 0.57. Favourable effect, d = 0.13. Favourable effect, d = 0.08. Favourable effect, small effect size d = 0.19. Favourable effect, small effect size d = 0.33.	Meta-A	Conn et al (2009)
Worksite interventions to increase PA, exercise or fitness	PA Fitness	√ √	Favourable effects, small effect size d= 0.23 Favourable effects, d= 0.15.	Meta-A	Abraham and Graham-Rowe (2009)
Worksite interventions to promote physical activity	PA or fitness (e.g. fitness, duration, EE or steps)	√	Favourable effects, small effect size d= 0.21.	Meta-A	Taylor et al. (2012)
Physical activity	Weight BMI Body fat % Waist circumference Waist-hip ratio	√ √ ~ ~ ~	Favourable effects, MD -1.08 kg, low quality. Favourable effects, MD -0.50 kg m-2, low quality. Could not be investigated properly due to lack of studies. Could not be investigated properly due to lack of studies. Could not be investigated properly due to lack of studies.	Meta-A	Verweij et al., (2011)
Interventions to increase physical activity	Anxiety	√	Can decrease anxiety symptoms among healthy adults. Larger improvements where targeted only PA behaviour instead of multiple health behaviours.	Meta-A	Conn (2010)
Workplace physical activity programs	Physical activity Fitness Muscle flexibility or	√ ~ ~	Strong evidence for positive effect. Inconclusive evidence. Inconclusive evidence.	Syst-R	Proper et al. (2003)

Intervention	Outcomes focus	Effective?	Summary sentence	Study T.	Author
	strength B. weight/composition General health Fatigue Blood serum lipids Blood pressure	~ ~ √ X X	Inconclusive evidence. Inconclusive evidence. Limited evidence, 3 studies. No effect shown. No effect shown.		
Workplace physical activity interventions	Daily step counts Physical activity Walking to work	√ √ √	Using pedometers can increase daily step counts. Strong evidence for counselling in public sector. One study of economically advantaged female employees reported an effect.	Syst-R	Dugdill et al. (2008)
Physical activity promotion interventions	Physical activity Physical fitness Obesity-related (BMI, BW, %BF, WC, WTHR)	√ √ ? or ~	Moderate for active commuting (AC). Moderate evidence for exercise, and limited for AC. Not measured (active commute) and inconclusive evidence for all other intervention categories.	Syst-R	Vuillemin et al. (2011)
Workplace physical activity interventions in men	Physical activity	~	5 of the 13 studies focusing on men showed effect	Syst-R	Wong et al (2012)
Workplace health promotion interventions for increasing physical activity	Physical activity	~	Can be efficacious, but overall results are inconclusive, 32 of the 58 (55%) showed an effect but quality of evidence varied considerably.	Syst-R	Malik (2014)
Workplace physical activity interventions	Physical activity, steps or BMI	.	12 of 20 interventions reported a positive effect in at least one of the outcomes; 7 of 8 with pre-post test and quasi-experimental controlled design, but 7 of 12 RCTs did not prove effective in any outcome.	Syst-R	To et al (2013)
<b>Economic outcome measures</b>					
Physical activity programs at worksites	Absenteeism Physical activity Job satisfaction Job stress	√ ~ ~ ~	Limited evidence despite shortcomings of the studies. Inconsistent results. Mixed results. Mixed results.	Sys-R	Proper et al. (2002)



Intervention	Outcomes focus	Effective?	Summary sentence	Study T.	Author
	Productivity Employee turnover	X ~	No evidence of a positive effect. Lack of studies.		
Workplace health-enhancing physical activity interventions	Sick leave Worker productivity	X ~	Consistent evidence that do not reduce levels of sick leave. Inconsistent evidence of the impact.	Syst-R	Pereira et al. (2015)
Specifically focused physical activity interventions					
Workplace pedometer interventions	PA & health outcomes	~	Limited/low quality data providing insufficient evidence	Syst-R	Freak-Poli (2013)
Stair-use interventions in worksites	Stair climbing	~	Evidence of effects is limited, increase in 64% of studies.	Syst-R	Bellicha (2015)
Selective					
Physical activity interventions <i>Healthcare professionals</i>	Weight Others^	~ ~	Pooled effect of 0.34 Kg up to 12 months, but insufficient studies. Insufficient studies/data. ^ BMI, body fat percentage, waist circumference, waist-hip ratio or diet and physical activity related outcomes	Syst-R and Meta-A	Power et al. (2014)
BW = Body weight, %BF = % body fat, WC = Waist circumference, WTHR = Waist-to-hip ratio, SFT = skin fold thickness					

### Nutrition and dietary interventions

Intervention	Outcomes focus	Effective?	Summary sentence	Study T.	Author
<b>Universal</b>					
Dietary behaviour	Weight BMI Body fat % Waist circumference Waist-hip ratio	? ~ ? ~ ?	No studies. Only one study. No studies. No studies. Only one study.	Meta-A	Verweij et al., (2011)
Nutrition programmes	Fruit and veg. intake Weight/BMI	√ ~	Moderate evidence. Insufficient studies.	Syst-R	Ni Mhurchu, Aston and Jebb (2010)
Nutrition interventions	Dietary behaviour	√ or ~	Moderate evidence for educational only and multi-component only, inconclusive for environmental only	Syst-R	Maes (2012)

	Anthropometrical Potential determinants	~ or ? √ or ~	Inconclusive evidence for educational only and multi-component only, no studies for environmental only. Moderate evidence for educational only and multi-component only, inconclusive for environmental only		
Workplace dietary modification interventions alone or with nutrition education	Fruit and veg. intake Other outcomes^	√ ~	Limited evidence, 4 out of 6 studies. Insufficient studies. ^ BMI and serum cholesterol levels; self-efficacy; perceived health; nutrition knowledge; determinants of food choice outcomes; co-worker support; job satisfaction; economic cost outcomes including absenteeism, productivity; healthcare costs and profit margins; food purchasing patterns.	Syst-R	Geaney et al. (2013)
<b>Selective</b>					
Dietary behaviour interventions <i>Healthcare professionals</i>	Weight Others^	~ ~	Only one study. Insufficient studies/data. ^ BMI, body fat percentage, waist circumference, waist-hip ratio or diet and physical activity related outcomes	Syst-R and Meta-A	Power et al. (2014)

### Weight loss and management programmes

Intervention	Outcomes focus	Effective?	Summary sentence	Study T.	Author
Workplace weight management – dietary, physical activity, environmental, behavioural and incentive-based components.	Body weight; BMI	?	3 of the 18 studies with data for 6–12 months had significant mean weight loss, from –3.95 to –8.80 kg.  The main finding was an exceptional diversity of results between different interventions, ranging from some interventions giving clinically significant weight loss of a magnitude to impact health and quality of life to others that caused less weight loss than control treatments.	Syst-R	Weerasekara et al., (2016)

## A-2: Effective for Smoking and Alcohol Consumption? Summary of Conclusions in the Literature

### Smoking cessation programmes

Intervention	Outcomes focus	Effective?	Summary sentence	Study T.	Author
Worksite smoking cessation programmes	Smoking quit rates	√ <sup>^</sup>	OR: 2.03 (95% CI 1.42 to 2.90) at 6 months OR: 1.56 (95% CI 1.17 to 2.07) at 12 months OR: 1.33 (95% CI 0.95 to 1.87) at 12+ months	Meta-A	Smedslund et al. (2002)
Workplace interventions for smoking cessation	Group therapy Individual counselling Self-help interventions Pharmacological interventions Incentives Multiple interventions	√ √ ~ √ ~ √	OR 1.71 (1.05 to 2.80) <sup>1,2,3</sup> OR 1.96 (1.51 to 2.54) <sup>3,4,5</sup> OR 1.16 (0.74 to 1.82) <sup>2,3</sup> OR 1.98 (1.26 to 3.11) <sup>3,4</sup> OR 1.60 (1.12 to 2.3) <sup>3,6</sup> OR 1.55 (1.13 to 2.13) <sup>3,4,7</sup>	Meta-A	Cahill & Lancaster (2014)
Worksite-based incentives and competitions to reduce tobacco use	Tobacco use reduction	~ or √	Insufficient evidence to determine the effectiveness of incentives or competitions, alone, strong evidence of effectiveness for incentives and competitions in combination with additional interventions.	Syst-R	Leeks et al. (2010)

Note. OR = Odds ratio.

<sup>^</sup> Effect present at 6 and 12 months but not present after 12 months.

1. 1 +outlier (Glasgow 1994); removing this study reduced the OR to 1.62 (0.98 to 2.66).

2. Removing self -reported (non-validated) abstinence studies made no significant difference to the results.

3. No funnel plot - too few studies.

4. Removing trials at high risk of bias made no difference

5. Possibility of publication bias

6. One trial (Volpp 2009) has 37% of the weight and is the only trial with positive findings. Removing it eliminates the statistical significance (OR 1.16 [0.73 to 1.83]).

7. Two non-validated, two partial validation, one 'bogus pipeline' and one CO.

## Alcohol consumption programmes

Intervention	Outcomes focus	Effective?	Summary sentence	Study Type	Author
<b>Health only outcomes</b>					
Workplace alcohol interventions	Alcohol consumption or related problems	~	9 out of 10 studies found statistically significant difference in measures such as alcohol consumption, binge drinking, and alcohol problems. Few methodologically adequate studies. Considerable variation in interventions, study designs, and work-places. Difficult to make comparisons. Some interventions appear to have potential to produce beneficial results.	Syst-R	Webb et al. (2009)
Workplace alcohol interventions in male dominated industries	Clinically significant alcohol-use issues e.g. Risky alcohol use Attitudes to drinking	~	The evidence on specific interventions in male dominated industries is limited. Further research to identify specific and effective interventions is needed.	Syst-R	Lee et al. (2014)

### A-3: Effective for Stress, Anxiety and Depression? Summary of Conclusions in the Literature

#### Stress management programmes

Intervention	Outcomes focus	Effective?	Summary sentence	Study T.	Author
<b>Universal</b>					
Occupational stress management programmes	Mental health Physiological Organizational	√ √ √/X	Favourable effect, moderate size $d = 0.727$ . Favourable effect, small size $d = 0.292$ . Favourable productivity $d = 0.703$ , no effect absenteeism.	Meta-A	Richardson and Rothstein (2008)
Psychoeducational interventions	Stress	√	The effect sizes reported in this review are small, but consistently positive, indicating effectiveness for this type of PSE. The overall effect (SMD = .27).	Meta-A	Van Daele et al. (2012)
Mindfulness-based interventions (MBIs)	Distress	√	Favourable effect, medium-to-large size for pre-post comparison and comparison an inactive control ( $g = 0.68$ ). Largely maintained at a median follow-up of 5 weeks.	Meta-A	Virgili (2015)
Job-stress interventions	Individual outcomes <sup>^</sup> Organisational outcomes <sup>^^</sup>	√ √	Favourable, individual approaches (85% of studies), <i>and</i> organizational approaches (85-90% of studies). Favourable, organizational approaches (75-97% of studies) but not for individual interventions (31% of studies).	Syst-R	Lamontagne et al. (2007)
Stress management interventions	Stress and mental health	√ or ~	Difficult to make definitive conclusions, reasonable evidence that multi-faceted training, covering stress awareness, coping and stress reduction is an effective format. Insufficient evidence to support massage therapy.	Syst-R	Gravelling et al. (2009)
Stress management interventions	Stress variables	√	Moderate evidence have at best a modest or short-term impact on a range of variables	Syst-R	BOHRF (2005)
<sup>^</sup> include somatic symptoms, physiologic changes (e.g., blood pressure, cholesterol levels), skills (e.g., coping ability), and psychological outcomes (e.g., general mental health, anxiety). <sup>^^</sup> include working conditions as well as those traditionally referred to as such absenteeism, employee turnover, injury rates, and productivity.					
<b>Selective</b>					
Work and person directed interventions to prevent	Stress	√	Low-quality evidence that CBT and mental and physical relaxation reduce stress more than no intervention but	Meta-A	Ruotsalainen et al. (2015)

stress <i>Healthcare workers</i>			not more than alternative interventions.		
Workplace stress management <i>Nurses</i>	Stress	~	Weak evidence for CT, some potentially effective but others not possible to draw conclusions.	Syst-R	Mimura and Griffiths (2003)
Organisational interventions for wellbeing & stress <i>Teachers</i>	Stress	√	Low quality evidence.	Syst-R	Naghieh et al. (2015)
Stress management interventions <i>Workers in mental health field</i>		.	A great deal is known about the sources of stress at work, about how to measure them and about their interaction and impact on a range of outcome indicators. Lacking a translation of these results into practice.	Syst-R	Edwards et al., (2002)
Stress management interventions <i>Teachers, social workers and healthcare professionals</i>	Common mental health problems	√ or ~	Strong evidence for healthcare professionals, limited evidence for teachers and no evidence for social workers (on study only)	Syst-R	BOHRF (2005)

### Anxiety and depressive symptoms

Intervention	Outcomes focus	Effective?	Summary sentence	Study T.	Author
<b>Universal</b>					
Occupational stress management programmes	Anxiety symptoms Mental health	√ √	Favourable effect, moderate size d = 0.678. Favourable effect, small to moderate size d = 0.441.	Meta-A	Richardson and Rothstein (2008)
Occupational stress-reducing interventions	Anxiety symptoms Depressive symptoms	√ √	Favourable effects, d ranges from 0.25 to 0.70 Favourable effects for certain interventions, d = 0.33 individual and d = 0.59 for multimodal interventions.	Meta-A	van der Klink et al. (2001)
Mental health interventions, majority used CBT	Prevention of depression	√	Small positive effect of treatment over control groups.	Meta-A	Tan et al. (2014)
Resilience building programmes	Psychological (anxiety, depression) Performance ^	√	Favourable and sustained effects, d= 0.17 at or within one month of the intervention and after this period d = 0.10 Favourable. But diminished over time except for programmes targeting individuals thought to be at greater risk of experiencing stress and lacking core protective	Meta-A	Vanhove et al. (2016)

	Wellbeing^^		factors. Favourable. But diminished over time except for programmes targeting individuals thought to be at greater risk of experiencing stress and lacking core protective factors. ^ supervisor-rated perf, successful task completion ^^ positive affect, purpose in life, subjective well-being		
Resilience training	MH & SWB outcomes^	√	Favourable effects, d = 0.78. ^ stress, depression, anxiety, negative affect	Syst-R	Robertson et al. (2014)
<i>Suicide prevention activities A mixture of universal and selective interventions.</i>		√	Very few workplace suicide prevention initiatives had been evaluated but the results from those that had been suggest that prevention initiatives had beneficial effects.	Syst-R	Milner et al. (2015)
<b>Indicated or with a diagnosis</b>					
Mental health interventions <i>With a diagnosis</i>	Depression, anxiety or both	√	Some primary, secondary and tertiary workplace interventions prevent as well as facilitate recovery from depression and/or anxiety.	Meta-A	Joyce et al. (2016)
Prevention strategies for depression <i>With a diagnosis</i>	Depression	√	The one study which met the inclusion criteria had a positive effect on people with depression, with a significant trend towards chances of recovery or remission after 1 year.	Syst-R	Dietrich et al. (2012)

#### A-4: Effective for Multi-component Workplace Health Promotion programmes? Summary of Conclusions in the Literature

Intervention	Outcomes focus	Effective?	Summary sentence	Study Type	Author
<b>Health only outcomes</b>					
Health promotion	Depression and anxiety	√	Small, but positive overall effects.	Meta-A	Martin et al. (2009)
Physical activity and/or diet programmes relevant to risk factors for cardiovascular disease (CVD)	Body weight;	√	Strong evidence for the effectiveness of workplace lifestyle-based interventions on body fat and, in populations at risk for CVD, body weight. Populations with an elevated risk of CVD seemed to benefit most from lifestyle interventions; supervised exercise interventions appeared the least effective intervention strategy.	Syst-R	Groeneveld et al (2010)
	Body fat;	√			
	Blood pressure;	~			
	Blood lipids and /or blood glucose	~			
Internet-based employee wellness and prevention programs  Cardiovascular outcomes	Physical activity	X	No improvements for virtually all the studies. Moderate improvements in more than half of the studies but overall unpredictable effects. General interventions may not be effective, insufficient evidence if targeted at people with elevated BP/hypertension. Number of high quality showing a favourable effect similar to the number showing no effect. Number of high quality showing a favourable effect similar to the number showing no effect. Too few high quality studies. Internet-based programs more successful if include physical contact and environmental modification.	Syst-R	Aneni et al. (2014)
	Weight related (WC, BMI, SFT, BF)	~			
	Blood pressure	X or ~			
	Lipid profile	~			
	Dietary change	~			
	Smoking cessation	~			
Worksite-based programmes relevant to weight loss	BMI;	~	“Worksite-based weight loss programs can result in modest short improvements in body weight; however, long-term data on health and economic outcomes are lacking.”	Syst-R	Benedict & Arterburn (2008)
	Body weight	√			
Organisational-level interventions	Employees' health	√	About half of the studies reported significant effects. Success rates higher among interventions tackling multiple rather than single organisational dimensions.	Syst-R	Montano et al. (2014)



Intervention	Outcomes focus	Effective?	Summary sentence	Study Type	Author
Interventions for WHP that use an Assessment of Health Risks with Feedback (AHRF) both alone and in combination with other intervention components (AHRF Plus)^	Tobacco use^	√	Strong or sufficient evidence for an effect.	Syst-R	Soler et al. (2010)
	Alcohol use^	√	Strong or sufficient evidence for an effect.		
	Dietary fat intake^	√	Strong or sufficient evidence for an effect.		
	Fruit & vegetable intake^	~	Insufficient evidence to determine effectiveness.		
	Physical activity^	√	Strong or sufficient evidence for an effect.		
	Blood press. cholesterol^	√	Strong or sufficient evidence for an effect.		
	Body composition^	~	Insufficient evidence to determine effectiveness.		
	Absenteeism^	√	Strong or sufficient evidence for an effect. ^ Results shown are for AHRF Plus. Concluded “difficult to draw conclusions” for AHRF intervention alone.		
Worksite health promotion programmes with environmental modifications	Dietary intake	√	Dietary intake: strong evidence for an effect.	Syst-R	Engbers et al. (2005)
	Physical activity	~	Physical activity: inconclusive evidence for an effect.		
	Health risk indicators	X	Health risk indicators: no evidence for an effect.		
<b>Economic or organisational outcomes only</b>					
Organizational wellness programmes	Absenteeism	√	Favourable effect, small, mean effect size was -.30.	Meta-A	Parks & Steelman (2008)
	Job satisfaction	√	Favourable effect, moderate, $d=.42$ .		
WHPPs promoting health and wellness, or reducing the risk of ill-health	Improvement in presenteeism	√	There is preliminary evidence that some WHP programs can positively affect presenteeism and that certain risk factors are of importance.	Syst-R	Cancelliere et al. (2011)
Active workplace interventions	Sickness absence	X or √	Do not seem generally effective. However, there is moderate evidence that graded activity reduces sickness absence and limited evidence that the Sheerbrooke model and CBT are effective.	Syst-R	Odeen et al. (2013)
<b>Multiple category outcomes</b>					
WHPP aimed at physical activity, healthy nutrition, weight loss, or smoking cessation	Self-perceived health	√	Favourable effect, small (ES= 0.23).	Meta-A	Rongen et al. (2013)
	Productivity at work	√	Favourable effect, small (ES= 0.21).		
	Sickness absence	√	Favourable effect, small (ES 0.29).		
	Work ability		ES= 0.23, 95% CI -0.07, 0.52).		
Workplace health	Sickness absences	√	Moderate evidence, risk ratio 0.78.	Meta-A	Kuoppala et al. (2008)

Intervention	Outcomes focus	Effective?	Summary sentence	Study Type	Author
promotion	Work ability	√	Moderate evidence, risk ratio 1.38.		
	Mental well-being	√	Seems to increase, risk ratio 1.39.		
	Physical well-being <sup>1</sup>	X	Does not seem to improve.		
	Disability pension	?	There is no evidence.		
Worksite wellness programmes	Physical activity	~	8 of 13 studies found improvements.	Syst-R	Osilla et al. (2012)
	Diet	~	6 of 12 studies found improvements.		
	BMI/weight	~	6 of 12 studies found improvements.		
	Mental health	~	3 of 4 studies found improvements.		
	Smoking	~	6 of 7 studies found significant reductions.		
	Alcohol use	~	2 of 3 studies found significant reductions.		
	Absenteeism	~	All 4 studies found significant decreases.		
	Healthcare cost	~	7 of 8 studies estimated significant decreases.		

BW = Body weight, %BF = % body fat, WC = Waist circumference, SFT = skin fold thickness.

<sup>1</sup> Physical well-being, was described by somatic symptoms, such as musculoskeletal discomfort or pain, and other physical symptoms.

## APPENDIX B: DETAILED PARAGRAPHS ON EFFECTIVENESS REVIEWS

### B.1 Physical Activity *and* Nutrition Interventions

Anderson et al. (2009) conducted a systematic review (with meta-analysis) of the effectiveness of worksite *nutrition and physical activity programs to promote healthy weight* among employees. Weight-related outcomes, including weight in pounds or kilograms, BMI, and percentage body fat were used to assess effectiveness of these programs. Most of the studies combined informational and behavioral strategies to influence diet and physical activity; fewer studies modified the work environment (e.g., cafeteria, exercise facilities) to promote healthy choices. Their study selection included those that evaluated a worksite health promotion program which included strategies involving diet, physical activity, or both. The results are pooled across all interventions that fit these categories (could include diet; physical activity; or diet and physical activity).

The review found that worksite programmes with nutrition and/or physical activity programmes achieve modest improvements in employee weight status at the 6-12-month follow-up. A pooled effect estimate of -2.8 pounds (95% CI= -4.6, -1.0) was found based on nine RCTs, and a decrease in BMI of -0.5 (95% CI= -0.8, -0.2) was found based on six RCTs. Anderson et al. (2012) note that “The findings appear to be applicable to both male and female employees, across a range of worksite settings.”

Verweij et al. (2011) produced a meta-analysis on the effectiveness of *workplace interventions targeting physical activity, dietary behaviour or both* and the studies included *weight outcomes*. They extracted data from 22 studies published between 1980 and November 2009, and the GRADE approach was used to determine the level of evidence for each pooled outcome measure. They report their findings by each broad category of intervention.

They found physical activity and dietary behaviour interventions show moderate quality of evidence to significantly reduce *body weight* (nine studies; mean difference [MD] -1.19 kg [95% CI -1.64 to -0.74]), *body mass index* (11 studies; MD -0.34 kg m<sup>-2</sup> [95% CI -0.46 to -0.22]) and *body fat percentage* calculated from sum of skin-folds (three studies; MD -1.12% [95% CI -1.86 to -0.38]). There were insufficient studies to draw conclusions for impacts on waist circumference and waist to hip ratio. No studies were available targeting physical activity and dietary behaviour and sum of skin-folds.

Hutchinson and Wilson (2012) undertook a meta-analysis of physical activity or nutrition intervention studies between 1999 and 2009. The meta-analysis found that workplace interventions were successful in achieving small improvements in health behaviours. Large

effects were seen for motivational enhancement approaches overall and for some specific measures of health and physical activity in studies using motivational enhancement approaches (change over time data only).

They conclude: “Interestingly, this review did not find evidence supporting the inclusion of multiple health behaviours. Interventions that were associated with one main area of change (e.g. diet OR physical activity OR health) were associated with larger mean effect sizes; future programmes may choose to focus on one area of particular interest or concern. Finally, in terms of study design, the current meta-analysis found that randomized controlled trials were associated with larger effects. Long-term maintenance of changes should also be evaluated in order to determine the extent to which workplace interventions can make sustainable changes to individuals’ health. Further research is necessary to identify strategies that achieve long-term behaviour change as well as those that help ‘at-risk’ individuals improve their health.”

Maes et al. (2012) undertook a systematic review of the effectiveness of intervention studies in European countries aiming at the primary prevention of obesity and obesity-related diseases in which the main component or one of the components was the *promotion of a healthy diet* and reported findings according to whether interventions had a nutrition only or nutrition *and* physical activity component too. It includes studies published from 1 January 1990 to 1 October 2010 and includes anthropometrical measures of obesity and dietary intake. There were no restrictions on study design.

Focusing on interventions with both a nutrition and physical activity they found thirteen studies, nine educational and four multi-component studies. Ten were rated as having 'weak' and three as having 'moderate' methodological quality. They found:

- Diet: Inconclusive evidence as five of the nine studies that evaluated the effect on diet (six educational and three multi-component) found a positive effect.
- Physical activity: Limited evidence for educational interventions, only three of the eight found an improvement in total physical activity and two of the eight showed a positive effect on physical activity in leisure time. Inconclusive evidence for multi-component interventions, two of the four found an effect on physical activity.
- BMI: Inconclusive evidence, one of five studies that evaluated the effect of educational interventions on BMI found a positive effect, and no positive effect was found in the two studies that reported the effect of multi-component interventions.
- Determinants: Inconclusive evidence, only four studies (two educational and two multi-component) aimed to influence the determinants of obesity with regard to dietary habits and three of these stated significant changes.

Maes et al. (2012) judge that “From this review, it can be concluded that there is only moderate evidence of effect of educational and multi-component dietary interventions on dietary behaviours and potential dietary determinants of such behaviours [see Chapter 4]. Combined nutrition *and* physical activity interventions showed less positive results. . . . Also, for all other assessed effects there was only inconclusive evidence again possibly due to a lack of studies in general and of high quality studies in particular.”

### Selective

Power et al. (2014) conducted a systematic review and meta-analysis of the effectiveness of workplace-based diet and/or physical activity interventions aimed at healthcare professionals. They reviewed 13 RCTs (involving 3,751 participants), seven of which had data available for meta-analysis. Only four studies reported being informed by a behaviour change theory. They aimed to report findings by behavioural target (diet only, physical activity only or diet and physical activity) and length of follow-up (<12 months and ≥12 months).

They found that nine studies reported statistically significant (between-group) differences in either dietary, physical activity or weight-related outcomes. Pooling results across the five studies which had follow up under 12 months showed that there was a significantly greater reduction in body weight (–2.03 Kg, [95% CI –3.92 to - 0.15 Kg]) in participants allocated to *some form* of active intervention (diet only, physical activity only or dietary and physical activity combined interventions) compared with controls. However, there was evidence of significant heterogeneity across studies. There was no statistically significant difference in body weight change (–2.60 Kg, [95% CI – 5.37 to 0.17 Kg]) between intervention and control groups across the three studies with follow-up ≥12 months. However, they note again that there was evidence of significant heterogeneity across studies, with diet and physical interventions again showing the largest effects.

Examining *only* interventions with dietary *and* physical activity elements they computed pooled effect size for weight but there was insufficient data to compute pooled effects for BMI, body fat percentage, waist circumference, waist-hip ratio or diet and physical activity related outcomes.

Meta-analysis of all trials reporting weight data demonstrated healthcare professionals allocated to both dietary *and* physical activity interventions lost significantly more body weight (–3.95 Kg, [95% CI –4.96 to - 2.95 Kg]) than controls up to 12 months follow up.

The results of the meta-analysis showed that workplace interventions which targeted both diet and physical activity resulted in the largest observed differences in weight reduction (2

studies – 1 Strong quality, 1 Moderate quality;  $-3.95$  Kg, [95% CI  $-4.96$  to  $-2.95$ ] in 237 healthcare professionals up to 12 months of follow-up). This effect is larger than those reported in previous meta-analyses of workplace-based interventions (those reviews had not however focused on healthcare professionals).

Power et al. (2014) conclude “Notwithstanding this, conclusions regarding the effectiveness of dietary and physical activity combined interventions on healthcare professional body weight are limited because of the small number of studies and small sample sizes. Therefore, these preliminary findings require confirmation by further RCTs with larger sample sizes.”

## B.2 Physical Activity Interventions

### Universal

Dishman et al (2008) carried out a meta-analysis on the effectiveness of *worksite interventions for increasing physical activity or fitness*. Their analysis included twenty-six studies involving about 9,000 subjects and yielded 45 effects. Some studies reported multiple effects, for example where they included separate results for gender, or more than one intervention condition or used multiple measures of physical activity. The mean effect was heterogeneous and small,  $r = 0.11$  (95% CI,  $-0.20$  to  $0.40$ ), approximating  $1/4$  S.D., or an increase in binomial success rate from 50% to 56%. This means the results indicate that the typical worksite intervention for increasing physical activity has yielded a small positive effect, which is not statistically different from zero (i.e. no effect). They commented that the typical worksite intervention has yet to demonstrate a statistically significant increase in physical activity or fitness and conclude “that the generally poor scientific quality of the literature on this topic precludes the judgment that interventions at worksites cannot increase physical activity or fitness, however such an increase remains to be demonstrated by studies using valid research designs and measures.”

Conn et al. (2009) carried out a meta-analysis of worksite *physical activity interventions* research. Approximately 38,231 subjects participated in the included studies. The outcomes measured were physical activity behaviour; health (fitness, lipids, anthropometric measures, diabetes risk); well-being (quality of life, mood); and work-related outcomes (work attendance, healthcare utilization, job stress, and job satisfaction). In terms of the interventions, supervised exercise was used in 27% of the studies while 80% used motivational or educational sessions. Significantly positive effects were observed for physical activity behaviour ( $d = 0.21$ ); fitness ( $d = 0.57$ ); lipids ( $d = 0.13$ ); work attendance ( $d = 0.19$ ); and job stress ( $d = 0.33$ ).

Conn et al. (2009) conclude “These findings document that some workplace physical activity interventions can improve both health and important worksite outcomes. Effects were variable for most outcomes, reflecting the diversity of primary studies. Future primary research should compare interventions to confirm causal relationships and further explore heterogeneity.”

Abraham and Graham-Rowe (2009) carried out a systematic review and meta-analysis to determine whether *worksite interventions are effective in increasing physical activity*. They included studies that included participants that were free from pre-existing medical conditions such as diabetes or cancer (but not necessarily health risk factors such as a high BMI or raised blood pressure). Thirty-seven intervention evaluations reporting 55 unique interventions were included.

Results indicate that, overall, worksite interventions have small, positive effects on PA and this effect is smaller when fitness (objectively measured) as opposed to physical activity (self-reported) outcome measures are reported ( $d_s = 0.15$  versus  $0.23$ ). Worksite interventions targeting PA specifically as opposed to general lifestyle change were found to be more effective, whether evaluated in terms of increased fitness ( $0.29$  versus  $0.08$ ) or increased self-reported PA ( $0.27$  versus  $0.14$ ). Those promoting walking as opposed to other forms of PA were also more effective ( $0.54$  versus  $0.16$ ). Interventions providing individually-tailored information or instructions were not found to be more effective, but there was evidence that specific goal setting and goal review techniques may enhance fitness gains.

Abraham and Graham-Rowe (2009) conclude: “given the potential public health and economic benefits, walking or step counting workplace interventions should be supported and rigorously evaluated using fitness measures.”

Taylor et al. (2012) carried out a meta-analysis to assess the effectiveness of *worksite interventions designed to promote physical activity* and investigate whether interventions explicitly based on theory are more effective, and inclusion of specific behaviour change techniques (BCTs) improves effectiveness. Worksite interventions with a primary aim of increasing physical activity and where outcome measures were objective or validated self-report were reviewed. Twenty-six studies reporting 27 evaluations were included in the meta-analysis and a random effects model produced an overall effect size ( $d$ ) of  $0.21$  (95% CI  $0.17-0.26$ ). Subgroup analysis indicated that interventions using theory more explicitly were more effective, producing an effect size of  $0.34$  (95% CI  $0.23-0.45$ ;  $I^2=0\%$ ). No significant differences in effect sizes were found between studies that had used individual BCTs and those that had not, and studies that used more techniques were not more effective. Taylor et al. (2012) conclude: “Overall, worksite physical activity interventions

were effective, but only produced small sized effects on physical activity. Theory-based interventions were more effective”.

As noted in Chapter 2, Verweij et al. (2011) produced a meta-analysis on the effectiveness of *workplace interventions targeting physical activity, dietary behaviour or both* and the studies included *weight outcomes*. Focusing just on interventions aiming to increase physical activity, they found:

- Weight: There is low quality of evidence from five studies (n = 283) that workplace interventions targeting physical activity significantly reduce body weight (MD -1.08 kg [95% CI -1.79 to -0.36]).
- BMI: There is low quality of evidence from two studies (n = 126) that workplace interventions targeting physical activity significantly reduce BMI (MD -0.50 kg m<sup>-2</sup> [95% CI -0.65 to -0.34]).
- Body fat: There is very low quality of evidence from two studies (n = 127) that workplace interventions targeting physical activity reduce percent body fat calculated from bioelectrical impedance or hydrostatic weighing (MD -0.56% [95% CI -2.53 to 1.42]).
- Waist circumference: There is low quality of evidence from two studies (n = 58) that workplace interventions targeting physical activity reduce waist circumference (MD -1.31 cm [95% CI -3.62 to +1.00]).
- Sum of skin-folds: There is low quality of evidence from two studies (n = 90) that workplace interventions targeting physical activity reduce sum of skin-folds (MD -0.01 mm [95% CI -0.04 to +0.02]).
- Waist–hip ratio: There is low quality of evidence from two studies (n = 223) that workplace interventions targeting physical activity do not reduce waist–hip ratio (MD 0 [95% CI -0.03 to 0.03]).

With regard to the effectiveness of physical activity interventions, Verweij et al. (2011) state that “There is low quality of evidence that workplace physical activity interventions significantly reduce body weight and BMI. Effects on percentage body fat calculated from bioelectrical impedance or hydrostatic weighing, waist circumference, sum of skin-folds and waist–hip ratio could not be investigated properly because of a lack of studies.”

Conn (2010) conducted a meta-analysis of anxiety outcomes of interventions to *increase physical activity* (PA) to healthy adults without anxiety disorders through a search of published and unpublished PA intervention studies with anxiety outcomes. Data were synthesized across 3,289 participants from 19 eligible reports. She found that the overall mean anxiety effect size (d index) for two-group comparisons was .22 with significant heterogeneity (Q = 32.15). With exploratory moderator analyses, larger anxiety improvement effect sizes were found among studies that included larger samples, used



random allocation of participants to treatment and control conditions, targeted only PA behavior instead of multiple health behaviors (e.g. interventions that attempted to change PA plus other behaviors, such as diet), included supervised exercise (vs. home-based PA), used moderate-or high-intensity instead of low-intensity PA, and suggested participants exercise at a fitness facility (vs. home) following interventions.

Conn (2010) concludes: “Some interventions can decrease anxiety symptoms among healthy adults. Exploratory moderator analyses suggest possible directions for future primary research to compare interventions in randomized trials to confirm causal relationships.”

Proper et al. (2003) reviewed the literature with respect to the effectiveness of worksite *physical activity programs on physical activity, physical fitness, and health*. Strong evidence was found for a positive effect of a worksite physical activity program on physical activity and musculoskeletal disorders. Limited evidence was found for a positive effect on fatigue: two RCTs, both of low quality, were identified, one of which showed relevant effect sizes in fatigue between the study groups and the other reporting a significantly greater increase of mental and physical fatigue in the reference group compared with the intervention group. For physical fitness, general health, blood serum lipids, and blood pressure, inconclusive or no evidence was found for a positive effect, which is mainly the result of the small number of high-quality trials. Proper et al. (2003) conclude: “To increase the level of physical activity and to reduce the risk of musculoskeletal disorders, we support the implementation of worksite physical activity programs. For the other outcome measures, scientific evidence of the effectiveness of such a program is still limited or inconclusive, which is mainly the result of a small number of high-quality trails. Therefore, we recommend performing more randomized, controlled trials of high methodological quality, taking into account criteria such as randomisation, blinding, and compliance.”

Dugdill et al. (2007) carried out a systematic review on behalf of NICE of the effectiveness of workplace *physical activity interventions*. This summary is based on their subsequent article in a peer-reviewed database. They note that evidence from previous systematic reviews was inconclusive. Dugdill et al. (2008) find that data regarding the effectiveness of stair walking interventions was limited. Seven studies assessed the effectiveness of posters or health messages (written, email or doctor’s email) on workplace stair-walking, but most were methodologically weak, based on behavioural observation rather than objective measurement, and intervention effects were short-lived; further research on effectiveness of interventions to increase stair-walking is required. Three public sector studies provided evidence that workplace walking interventions using pedometers can increase daily step counts. They note that one good quality study reported a positive intervention effect on walking to work behaviour (active travel) in economically-advantaged female employees. They note there was strong evidence that workplace counselling influenced physical activity

behaviour. There is a dearth of evidence for small and medium enterprises (SMEs). Overall Dugdill et al. (2008) conclude that “there is a growing evidence base that workplace physical activity interventions can positively influence physical activity behaviour.”

Vuillemin et al. (2011) conducted a systematic review of the effectiveness of *worksite physical activity promotion interventions* in Europe. The authors included worksite interventions that had examined physical activity or physical fitness outcomes and identified among these studies those that had measured obesity-related outcomes. They included 33 studies and categorize interventions as exercise training, counselling, stair use, active commuting, walking and multi-component. The outcome measure had to be a difference in change in physical activity, such as habitual physical activity level, and/or in physical fitness, such as cardiorespiratory fitness, strength, and/or in obesity-related outcomes such as BMI, body weight, percentage body fat, waist circumference or waist-to-hip ratio.

They concluded that “active commuting and exercise training appear as promising approaches to promote physical activity or fitness in the workplace. The effect of interventions on obesity-related outcomes remains to be further investigated”.

Wong et al. (2012) carried out a systematic review to investigate the effects of workplace *physical activity interventions in men* and to identify key issues for further intervention development. Only 13 studies (10.5%) reviewed focused on men, of which 5 showed significant increases in PA. These studies used generic, multicomponent, health promotion strategies with a variety of timeframes, self-report PA measures, and PA outcomes. The authors concluded “that evidence on the effectiveness of workplace PA interventions for men is equivocal” or open to more than one interpretation.

Malik (2014) carried out a systematic review of *workplace health promotion interventions for increasing physical activity*. Of the 58 studies included, the majority used health promotion initiatives. There were six physical activity/exercise interventions, 13 counselling/support interventions, and 39 health promotion messages/information interventions. Of these studies 32 showed a statistically significant increase in a measure of physical activity against a control group at follow-up. However, overall the authors found the results to be inconclusive, partly due to the volume of studies in which no difference was observed or in which both the control and intervention conditions demonstrated similar increases in the levels of physical activity, and partly due to the fact that the quality of evidence varied considerably. The authors identified some common methodological limitations, related in part to outcome measurements of physical activity (most studies relied on self-report measures) and the fact that many of the reviewed interventions included multiple heterogeneous components, making it impossible to attribute the success of a particular intervention to a specific intervention component. Therefore, they conclude

that the evidence base is not overwhelmingly strong and that although there is evidence that “workplace physical activity interventions can be efficacious, overall the results are inconclusive”. There is a need for “more well-designed studies to fully determine the effectiveness of workplace interventions for increasing physical activity”.

To et al. (2013) carried out a systematic review of workplace *physical activity interventions*. The outcomes required to be measured were physical activity, energy consumption or body mass index (BMI). The authors found that 12 (60%) of 20 selected interventions reported an improvement in at least one physical activity level, steps, or BMI outcome measure. Among the 12 interventions for which an improvement was reported, 10 were less than 6 months in duration; 9 used pedometers; 6 applied Internet-based approaches; and 5 included activities targeting social and environmental levels.

Seven of 8 interventions with pre-/post-test and quasi-experimental controlled design showed improvement on at least one outcome. However, 7 of 12 randomized controlled trials (RCTs) did not prove effective in any outcome.

The review does not discuss the effectiveness or not of interventions by each of the three particular outcomes (physical activity, energy consumption or BMI) individually. It does note that among effective interventions, ranges of the changes for four common indicators (i.e., change in step counts, in energy expenditure, in BMI, and in metabolic equivalent of task minutes [MET-minutes] per week) were (1) 126 to 3451 steps/d; (2) 176.18 to 370 kcal/d; (3) -0.04 to -1.0 BMI unit (kg/m<sup>2</sup>); and (4) 205.8 to 887.25 MET-min/wk.

To et al. (2013) did not draw a conclusion on overall effectiveness. They did conclude that “Interventions that had less rigorous research designs, used pedometers, applied Internet-based approaches, and included activities at social and environmental levels were more likely to report being effective than those without these characteristics”.

Proper et al. (2002) systematically reviewed the literature on the effectiveness of physical activity programs at worksites with respect to work-related outcomes. Eight studies were identified, but their methodological quality was generally poor. Limited evidence of a positive effect was found for absenteeism and no evidence of a positive effect was found for productivity.

With regard to absenteeism, they note that despite the shortcomings of most of the trials, the outcomes suggest that there is limited evidence for the effectiveness of physical activity programs at worksites on absenteeism from work. For absenteeism, two randomized controlled trials were retrieved; one of high quality and one of low quality. The randomized controlled trial of high quality reported positive results, in contrast to the second

randomized controlled trial identified, which was of low quality. As studies with lower methodological quality are supposed to have biased findings, the authors highly value the (positive) result of the one high-quality randomized controlled trial. Consequently, they believe that physical activity programs at worksites may offer relevant benefits for business and corporations regarding absenteeism from work. In addition, the difference in the study population and the intervention of the reference group between the two randomized controlled trials in question may explain the contradictory findings.

On productivity, Proper et al. (2002) find “different results were found between the studies evaluating the effectiveness on subjective and objective measures. The only randomized controlled trial examining the effect on perceived productivity showed a positive effect, whereas the same trial, plus another randomized controlled trial, could not find a change in favour of physical activity programs at worksites with respect to objectively measured productivity. These contradictory findings suggest that the experience of workers with regard to their productivity does not necessarily reflect what they, in fact, produce. Another plausible explanation for this contradiction may be that the subjects involved in the studies using objective measures were mainly blue-collar workers, whose productivity is determined by machinery instead of by worker control. Thus it may be that an increase in physical activity will lead indeed to feelings of improved efficiency, while in fact productivity rates remain constant because of machinery control.”

Proper et al. (2002) conclude that “The scientific evidence on the effectiveness of physical activity programs at worksites is still limited. Because of the few high quality randomized controlled trials, it is strongly suggested that this type of study be carried out.”

Pereira et al. (2015) carried out a systematic review of the impact of onsite workplace *health-enhancing physical activity interventions on worker productivity*. Eight studies were included in the review. The authors found consistent evidence that onsite workplace HEPA (health-enhancing physical activity) programmes do not reduce levels of sick leave. They found inconsistent evidence of the impact of onsite workplace HEPA programmes on worker productivity, i.e. one good and one moderate-quality study found evidence of improved worker productivity as a result of particular workplace HEPA interventions, but two further high-quality studies and four of moderate quality did not show any benefit. The studies that showed benefit were mainly those designed with productivity measures as primary outcomes, delivered to occupations with higher physical loads, and had higher compliance and programme intensity. Pereira et al. (2015) conclude: “There is no benefit of onsite workplace HEPA programmes on worker absenteeism measures. There is inconsistent evidence regarding the effect of onsite workplace HEPA programmes on self-reported worker productivity measured with presenteeism measurement tools.” They also note that

“Primary studies of onsite workplace HEPA programmes of high quality and designed around appropriate participant populations and productivity outcomes are needed.”

Freak-Poli et al. (2013) carried out a systematic review to assess the effectiveness of *pedometer interventions* in the workplace for increasing *physical activity and improving subsequent health outcomes*. They found four relevant studies providing data for 1,809 employees, 60% of whom were allocated to the intervention group. All studies assessed outcomes immediately after the intervention had finished and the intervention duration varied between three to six months.

All studies had usual treatment control conditions; however one study’s usual treatment was an alternative physical activity programme while the other three had minimally active controls. In general, there was high risk of bias mainly due to lack of blinding, self-reported outcome measurement, incomplete outcome data due to attrition, and most of the studies had not published protocols, which increases the likelihood of selective reporting.

Three studies compared the pedometer programme to a minimally active control group, but the results for physical activity could not be combined because each study used a different measure of activity. One study observed an increase in physical activity under a pedometer programme, but the other two did not find a significant difference. For secondary outcomes they found improvements in body mass index, waist circumference, fasting plasma glucose, the quality of life mental component and worksite injury associated with the pedometer programmes, but these results were based on limited data from one or two small studies. There were no differences between the pedometer programme and the control group for blood pressure, a number of biochemical outcomes and the quality of life physical component. Sedentary behaviour and disease risk scores were not measured by any of the included studies. One study compared a pedometer programme and an alternative physical activity programme, but baseline imbalances made it difficult to distinguish the true improvements associated with either programme. Overall, there was insufficient evidence to assess the effectiveness of pedometer interventions in the workplace.

Freak-Poli et al. (2013) conclude: “There was limited and low quality data providing insufficient evidence to assess the effectiveness of pedometer interventions in the workplace for increasing physical activity and improving subsequent health outcomes.”

Bellicha et al. (2015) performed a systematic review of the effectiveness of *stair-use interventions* in work-sites and public settings. They review 50 studies. In worksites (25 studies) and public settings (35 studies), an increase in stair climbing was found during the intervention period in 64% and 76% of studies, respectively. They conclude: “There is evidence that stair-use interventions are effective to increase stair climbing in public

settings, but evidence of such effect is limited in worksites. . . In worksites, stair climbing is increased to a larger extent when directional signs supplement motivational signs. . . Issues regarding the best sequencing of interventions or the potential importance of environmental interventions should be addressed in future studies. Process evaluation should be an integral part of interventions.”

Bellicha et al. (2015) recommend designing more effective interventions in worksites because the significant opportunities generally afforded in the workplace to climb stairs during the day could allow a large number of people to reach the recommended level of physical activity.

### Selective

As noted in Chapter 2, Power et al. (2014) conducted a systematic review and meta-analysis of the effectiveness of workplace-based diet and/or physical activity interventions aimed at healthcare professionals. Examining *only* interventions aiming to increase physical activity only they computed pooled effect size for weight, but there were insufficient data to compute pooled effects for BMI, body fat percentage, waist circumference, waist-hip ratio or diet and physical activity related outcomes.

Meta-analysis of all trials reporting weight data demonstrated healthcare professionals allocated physical activity interventions showed no effect on body weight (0.34 Kg, [95% CI - 2.46 to + 3.14 Kg]) compared to controls up to 12 months follow up. However, this is based on only two studies and low sample size, pooled intervention groups of only 20 participants and 14 in the control groups.

## B.3 Nutrition and Dietary Interventions

### Universal

As noted in Chapter 2, Verweij et al. (2011) produced a meta-analysis on the effectiveness of *workplace interventions targeting physical activity, dietary behaviour or both* and the studies included *weight outcomes*. Focusing just on interventions aiming to improve *dietary behaviour* they found insufficient studies to draw conclusions as per outcome measure either one study (BMI, waist–hip ratio) or no studies (weight, body fat, waist circumference, sum of skin-folds) were found.

Ni Mhurchu, Aston and Jebb (2010) conducted a systematic review to assess the effects of *worksite-based weight loss and/or healthy eating interventions*. To be eligible for inclusion, articles had to report one or more dietary outcomes and have a minimum study duration of eight weeks. All study designs were eligible. A total of 16 studies were included. Eight

studies implemented programmes focussing on employee education; two targeted changes to worksite policy and/or environment; and six employed a combination of education and environmental changes.

Strategies to deliver education to employees included group and/or individual counselling, shopping tours, individual diet plans, computer-tailored dietary feedback, weekly health promotion email messages, and worker participation in programme planning. Environmental interventions comprised changes to worksite nutrition policies and practices such as nutrition labelling, vending policies, canteen food supply/availability, and menu reformulation. Duration of follow-up ranged from 12 weeks to 2.5 years. The authors judge the methodological quality of studies to be moderate.

- **Dietary results:** Twelve studies measured fruit/vegetable intakes and nine measured total fat intakes. In two RCTs that measured proportional change in combined fruit and vegetable intakes, average daily increases ranged from +3% to +16% in intervention groups compared with -2% to +4% in control groups. In almost all studies, reported improvements in diet quality were greater in intervention groups compared with controls. In five RCTs that measured total fat as a percent of energy by intervention group, average daily reductions ranged from -2.2% to -9.1% in intervention groups compared with +1.3% to -1.8% in control groups. They note that in general, the effects of worksite interventions on diet were positive, but the self-reported nature of dietary assessment means there is a substantial risk of bias
- **Anthropometric results:** Only three of the 16 studies also reported effects on body weight. In two (a RCT and an uncontrolled intervention study), weight loss results were broadly consistent with reported dietary changes, but in one (a RCT) the intervention group increased their BMI more than the control group.
- **Economic results:** No study included in the review measured the effect of worksite interventions on employee absenteeism, productivity and/or healthcare costs.
- **Environmental interventions:** The eight studies that evaluated the effectiveness of worksite environmental interventions alone or in combination with health education were generally positive for dietary outcomes but effect sizes were small. They note that direct comparison with the eight studies that evaluated employee education interventions is difficult due to variability in study design and outcome measures, but typically individual-level interventions appeared to deliver slightly greater effects than environmental interventions.

They note that “The findings of this systematic review suggest that worksite interventions are effective in improving some measures of dietary behaviour. Effect sizes are variable but are generally small, although decreases of up to 9% in total dietary fat and increases up to 16% in daily fruit and vegetable intakes have been reported. However, worksite intervention research has typically been methodologically weak and many studies have not included appropriately matched control groups, meaning reported effects may be due to trial participation rather than the actual worksite intervention programme. The use of self-reported dietary outcomes in most studies is a particular cause for concern because reporting bias due to dietary education makes it probable that effects on diet are over-estimated.”

Ni Mhurchu, Aston and Jebb (2010) conclude: “The findings of this review suggest that worksite health promotion programmes are associated with moderate improvement in dietary intake. The quality of studies to date has been frequently sub-optimal and further, well designed studies are needed in order to reliably determine effectiveness and cost-effectiveness. Future programmes to improve employee dietary habits should move beyond individual education and aim to intervene at multiple levels of the worksite environment.”

As noted in Chapter 2, Maes et al. (2012) undertook a systematic review of the effectiveness of intervention studies in European countries aiming at the primary prevention of obesity and obesity-related diseases in which the main component or one of the components was the *promotion of a healthy diet*, and reported findings according to whether interventions had a nutrition only or nutrition *and* physical activity component too.

Focusing on promotion of a healthy diet, it found seventeen studies solely focusing on promotion of a healthy diet (nutrition only). Eight were educational, one used worksite environmental change strategies, and eight used a combination of both (multi-component). None of the interventions were rated as 'strong'; seven met the criteria for 'moderate' quality. The reviewed studies show moderately evidence for effects on diet.

Only four nutrition only studies reported effects on body composition. One programme, using only educational materials, reported a long-term effect on BMI in the positive direction. However, one study implementing a multi-component intervention showed a small effect on BMI in the wrong direction. All educational studies documented the effect on dietary behaviour; only in two studies no effect was found. The environmental-only study reported a significant effect on the consumption of fruit and vegetables during lunch. Out of seven multi-component studies focussing on the effectiveness regarding dietary behaviour, six reported positive changes; in three programmes a sustained effect at the long term was detected. Only two studies on multi-component programmes mentioned the effect on



dietary determinants. Both reported a positive effect, one study even noted a sustained effect at the long term.

Maes et al. (2012) conclude: “From this review, it can be concluded that there is only moderate evidence of effect of educational and multi-component dietary interventions on dietary behaviours and potential dietary determinants of such behaviours. Combined nutrition and physical activity interventions showed less positive results. Based on the present review we could not conclude that any of the types of interventions consistently produced effects on body composition but this may be due to the lack of studies in general and high quality studies in particular. Also, for all other assessed effects there was only inconclusive evidence again possibly due to a lack of studies in general and of high quality studies in particular.”

Geaney et al. (2013) carried out a systematic review to evaluate the effectiveness of *workplace dietary modification interventions* alone or in combination with nutrition education on employees' dietary behaviour. Interventions were included if they were implemented for at least three months, and if they included any one or more of the following dietary modifications: changes in dietary content of available food/ meals as a result of modified food preparation practices (e.g. reduction in salt, sugar or fat content); changes in portion size; changes in the food choices available to employees.

The primary outcome of interest was a change in dietary behaviour, assessed using 24-h dietary recall measures, food diaries, weighed food records, food frequency questionnaires (FFQs) or other dietary assessment methods. Secondary outcomes included: clinical health status outcomes such as BMI and serum cholesterol levels; self-efficacy; perceived health; nutrition knowledge; determinants of food choice outcomes; co-worker support; job satisfaction; economic cost outcomes including absenteeism, productivity; healthcare costs and profit margins; and food purchasing patterns.

Six studies conducted in Brazil, the USA, Netherlands and Belgium were included. Heterogeneity between studies precluded meta-analysis, therefore a narrative summary was used to present results.

Four studies reported small increases in fruit and vegetable consumption ( $\leq$ half serving/day). These studies involved workplace dietary modifications and three incorporated nutrition education.

Other outcomes reported included health status, co-worker support, job satisfaction, perceived health, self-efficacy and food-purchasing patterns.

All studies had methodological limitations that weakened confidence in the results. The authors concluded that “limited evidence suggests that workplace dietary modification interventions alone and in combination with nutrition education increase fruit and vegetable intakes. These interventions should be developed with recommended guidelines, workplace characteristics, long-term follow-up and objective outcomes for diet, health and cost.”

### Selective

As noted in Chapter 2, Power et al. (2014) conducted a systematic review and meta-analysis of the effectiveness of workplace-based diet and/or physical activity interventions aimed at healthcare professionals.

Examining *only* interventions aiming to change dietary behaviour, they looked to compute pooled effect sizes but they found insufficient data to compute pooled effects, only one study for weight and no studies for BMI, body fat percentage, waist circumference, or waist-hip ratio.

### B.4 Weight Loss or Management Interventions

Weerasekara et al. (2016) conducted a systematic review of randomized trials of *workplace weight management interventions*, including trials with dietary, physical activity, environmental, behavioral, and incentive-based components.

Two categories of intervention time were defined (total duration 6-12 or 13-24 months) and two primary outcomes: change in weight and change in BMI. 23 studies were included, most from USA and Europe, with additional reports from Australia, Japan and Brazil.

Interventions all had weight management or reduction as their primary purpose. They were mostly multi-component, typically covering dietary intake as well as other factors such as physical activity, and in some cases provided behavioural support for changes. Interventions targeted at environmental modifications were always combined with nutrition and physical activity components. In studies with behavioural change elements, these were combined with other interventions components with theoretical underpinnings ranging from CBT to the social ecological model. One study provided financial incentives as the main intervention while in others, FIs were combined with other components. The financial incentives were provided for a specific amount of weight loss, or for intervention participation. In terms of mode of delivery, most interventions involved in-person

counselling and provision of printed material, but some added a web/email component and/or phone contact.

Most studies conducted evaluations for 6-12 months. Only three of these had significant mean weight loss, with mean values ranging from -3.95 to -8.80kg. Those studies were from the USA and Australia, and the authors note that none had included a financial incentive or attendance at sessions for intervention implementation. Two additional studies had mean values within the range of the significant studies but were not significantly different from controls due to high variability in data between subjects. One of the studies that reported data for 13-24 month interval found that weight loss was sustained in the follow-up period. The authors find that these results suggest that some workforce interventions are producing clinically meaningful weight loss with the possibility for sustainability over time.

Overall, the authors found a strong diversity of results between different interventions, ranging widely from clinically significant 8.8kg weight loss in one trial to less effective than the control treatment in others.

Noted limitations of the review include a small number of eligible studies, and the diversity of interventions, so that there was no clear relationship between the type of intervention and the results obtained. In addition, the quality review benchmark was set at 50% in order to include a reasonable number of studies in the review. The authors conclude that “at the moment it is not possible to evaluate whether the effectiveness of interventions is comparable in large, medium and small-sized work settings and different types of employees”, and that “further studies are needed to evaluate success in different workplaces with different types of interventions.”

## B.5 Smoking and Alcohol Interventions

Smedslund et al. (2002) carried out a meta-analysis to compare the effectiveness of recent controlled trials of worksite smoking cessation during the 1990s with a previous meta-analysis of programmes conducted in the 1980s. The criteria for study selection were controlled smoking cessation interventions at the workplace with at least six months follow-up published from 1989 to 2001 and reporting quit rates (QRs).

19 studies were included. Interventions included self-help manuals, physician advice, health education, cessation groups, incentives, and competitions. A total of 4960 control subjects were compared with 4618 intervention subjects. The adjusted random effects odds ratio was 2.03 (95% confidence interval 1.42 to 2.90) at six months follow up, 1.56 (95% CI 1.17 to 2.07) at 12 months, and 1.33 (95% CI 0.95 to 1.87) at more than 12 months follow up. In the 1990 comparison study (Fisher et al.), the corresponding QRs were 1.18, 1.66, and 1.18.

The authors concluded that smoking cessation interventions at the worksite showed initial effectiveness, but the effect seemed to decrease over time and was not present beyond 12 months. They found methodological inadequacies and insufficient reporting of key variables similar to those found in the earlier MA, which prevented them from drawing conclusions in relation to the most effective components of interventions. They recommend that future studies report data on attrition and retention rates of participants who quit, because these variables can affect QRs.

Cahill and Lancaster (2014) carried out a systematic review (updating a previous review), the objectives of which were to categorize workplace interventions for smoking cessation tested in controlled studies and to determine the extent to which they help workers to stop smoking, and to collect and evaluate data on costs and cost effectiveness associated with workplace interventions.

57 studies (61 comparisons) were included in this updated review. The authors found 31 studies of workplace interventions aimed at individual workers, comprising group therapy, individual counselling, self-help materials, nicotine replacement therapy, and social support, and 30 studies which tested interventions applied to the workplace as a whole, i.e. environmental cues, incentives, and comprehensive programmes. The trials were generally of moderate to high quality, with results that were consistent with those found in other settings. Group therapy programmes (odds ratio (OR) for cessation 1.71, 95% confidence interval (CI) 1.05 to 2.80; eight trials, 1309 participants), individual counselling (OR 1.96, 95% CI 1.51 to 2.54; eight trials, 3516 participants), pharmacotherapies (OR 1.98, 95% CI 1.26 to

3.11; five trials, 1092 participants), and multiple intervention programmes aimed mainly or solely at smoking cessation (OR 1.55, 95% CI 1.13 to 2.13; six trials, 5018 participants) all increased cessation rates in comparison to no treatment or minimal intervention controls.

Self-help materials were less effective (OR 1.16, 95% CI 0.74 to 1.82; six trials, 1906 participants), and two relapse prevention programmes (484 participants) did not help to sustain long-term abstinence. Incentives did not appear to improve the odds of quitting, apart from one study which found a sustained positive benefit. There was a lack of evidence that comprehensive programmes targeting multiple risk factors reduced the prevalence of smoking.

The authors found strong evidence that some interventions directed towards individual smokers increase the likelihood of quitting smoking. These interventions include individual and group counselling, pharmacological treatment to overcome nicotine addiction, and multiple interventions targeting smoking cessation as the primary or only outcome. All these interventions show similar effects whether offered in the workplace or elsewhere. Self-help interventions and social support are less effective. Although people taking up these interventions are more likely to stop, the absolute numbers who quit are low.

The authors did not find an effect of comprehensive programmes targeting multiple risk factors in reducing the prevalence of smoking, although this finding was not based on meta-analysed data.

They found limited evidence that participation in programmes can be increased by competitions and incentives organized by the employer, although one trial demonstrated a sustained effect of financial rewards for attending a smoking cessation course and for long-term quitting. The authors argue that further research is needed to establish which components of this trial contributed to the improvement in success rates.

Leeks et al. (2010) carried out a systematic review to evaluate the evidence of effectiveness of worksite-based incentives and competitions to reduce tobacco use among workers. These interventions offer a reward to individuals or to teams of individuals on the basis of participation or success in a specified smoking behaviour change (such as abstaining from tobacco use for a period of time). 14 studies were included, all of which evaluated incentives and competitions when implemented in combination with a variety of additional interventions, such as client education, smoking cessation groups, and telephone cessation support. 13 of the included studies evaluated differences in tobacco-use cessation among intervention participants, with a median follow-up period of 12 months. The median change in self-reported tobacco-use cessation was an increase of 4.4 percentage points (a median relative percentage improvement of 67%). The present evidence is insufficient to determine

the effectiveness of incentives or competitions, when implemented alone, to reduce tobacco use. However, the included studies provide strong evidence that worksite-based incentives and competitions in combination with additional interventions are effective in increasing the number of workers who quit using tobacco.

Webb et al. (2009) carried out a systematic review of the methodological adequacy of workplace-based alcohol interventions, aimed at identifying which interventions ought to be recommended for implementation. It searched papers from January 1995 to September 2007. 10 studies were included, and 9 out of 10 studies found statistically significant difference in measures such as alcohol consumption, binge drinking, and alcohol problems. However, the authors judged that few studies were methodologically adequate. Both the internal validity and the generalizability of study results were limited: “Study designs, types of interventions, measures employed and types of work-places varied considerably, making comparison of results difficult.” They conclude that “it appears from the evidence that brief interventions, interventions contained within health and life-style checks, psychosocial skills training and peer referral have potential to produce beneficial results.”

Lee et al. (2014) carried out a systematic review to examine the efficacy of interventions for risky alcohol use among workers in male-dominated industries to assist workplaces in making decisions for effective responses. They searched for studies from January 1990 to June 2012. Eight studies met the inclusion criteria. The authors found that the evidence on specific interventions for alcohol use problems in male-dominated industries was limited. The review concludes that interventions are feasible in the workplace, even within a culture that is typically ambivalent about addressing risky drinking. It notes that alcohol screening, secondary prevention, and low-intensity intervention activities may be effective for those identified as risky drinkers; while health and well-being promotion activities and alcohol testing, which were examined in a number of studies, did not appear to have an impact on drinking rates. However, overall the review is inconclusive on the effectiveness of interventions. The authors conclude: “Further research to identify specific and effective interventions to address alcohol use, both at the individual and at the workplace level, is needed.”

## B.6 Stress Management Interventions

### Universal<sup>14</sup>

Richardson and Rothstein (2008) conducted a meta-analysis of effects of *occupational stress management intervention programs*. A total of 36 experimental studies were included, representing 55 interventions. The studies primarily assessed secondary intervention strategies to reduce the severity of an employee's stress symptoms and only 8 studies included components that were considered primary intervention strategies such as increasing workers' decision-making authority or social support within the organisation. As many as 25 studies included relaxation and meditation techniques, and 20 included cognitive-behavioral skills training. The average length of intervention was 7.4 weeks. The studies reported psychological outcomes (stress, anxiety, mental health and work-related outcomes), physiological outcomes and organisational outcomes (productivity and absenteeism). A higher number of the studies focused on psychological outcomes (52) than physiological (14) and organisational (11) outcomes.

Richardson, and Rothstein (2008) found an overall weighted effect size (Cohen's *d*) for all studies was 0.526 (95% confidence interval = 0.364, 0.687), a significant medium to large effect. Examination of treatment length, outcome variable, and sector of employment (office workers, healthcare or education) did not reveal significant variations in effect size by intervention type.

Interventions were coded as cognitive-behavioral, relaxation, organizational, multimodal, or alternative. Analyses based on these subgroups suggested that intervention type played a moderating role. Cognitive-behavioral programs consistently produced larger effects than other types of interventions, but if additional treatment components were added the effect was reduced.

The results suggest that interventions that focus on a single component are more effective than those that focus on multiple components. The general trend is that as each component is added, the effect is reduced. However, there was significant heterogeneity among the one-component studies ( $I^2 = 81.6$ ,  $Q = 103.0$ ,  $p < .001$ ), and the results . . . are confounded

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<sup>14</sup> Two studies with a country specific focus not included in this Review include Caulfield, N., Chang, D., Dollard, M. F., & Elshaug, C. (2004). A review of occupational stress interventions in Australia. *International Journal of Stress Management*, 11, 149–166; Giga, S. I., Noblet, A. J., Faragher, B., & Cooper, C. L. (2003). The UK perspective: A review of research on organizational stress management interventions. *Australian Psychologist*, 38, 158–164.

by intervention type. For example, the one-component interventions with the largest effects were cognitive-behavioral interventions ( $k = 2$ ,  $d = 1.230$ , 95% CI = -0.968, 3.428).

Focusing on outcomes variables they found that (number of studies in brackets, and \* means  $p < .05$ ; \*\* means  $p < .01$ ; \*\*\* means  $p < .001$ ):

- Psychological: all combined 0.535\*\*\* (52), stress 0.727\*\*\* (18), anxiety 0.678\*\*\* (22), mental health 0.441\*\*\* (16) and work-related outcomes 0.183 (23). Work-related outcomes include job/work satisfaction, motivation, social support, daily hassles, role ambiguity, role overload, and perceived control.
- Physiological: all combined 0.292\* (14).
- Organizational: all combined 0.267 (11), productivity 0.703\*\*\* (4) and absenteeism - 0.059 (7).

Van Daele et al. (2012) undertook a meta-analysis to evaluate the effectiveness of *psychoeducational interventions*<sup>15</sup> in reducing stress and to gain more insight in determining features moderating the magnitude of effects. Nineteen studies met the inclusion criteria; for 16 studies, a standardized mean difference could be calculated.

They found that the average effect size was .27 (95% confidence interval = [-.14, .40]) at post-test and .20 (95% confidence interval = [-.04, .43]) at follow-up. To determine possible moderators of intervention effects, Van Daele et al. (2012) included all 19 studies. This showed that interventions that were shorter in duration provided better results. When a model with multiple moderators was considered, a model combining both intervention duration and the number of women participating in an intervention was significant and accounted for 42% of the variability found in the data set. Overall, interventions with more women participating that were shorter in duration obtained better results.

Van Daele et al. (2012) conclude: "The effect sizes reported in this review are small, but consistently positive, indicating effectiveness for this type of PSE. The overall effect (SMD = .27) is larger than in similar meta-analyses, for example, the study by Martin et al. (2009) on the effects of health promotion interventions for depression and anxiety symptoms (SMD = .05)" and in terms of characteristics of this type of intervention that would make it less or more effective "only intervention duration appeared as a significant moderator."

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<sup>15</sup> Van Daele et al. (2012) note "A technique often used to manage stress is psychoeducation (PSE). The goal of PSE is to help people acquire competencies to manage stress and preserve their mental health. The transfer of knowledge and the acquisition of skills are reached in individual encounters, in group sessions, and/or through homework assignments. Preventive PSE is primarily offered to groups. Oftentimes health care providers make use of group sessions, but the Internet or self-help groups are also valid options."



Virgili (2015) undertook a meta-analysis to assess the effectiveness of *mindfulness-based interventions (MBIs) for reducing psychological distress* in working adults. A mindfulness intervention was defined as one in which mindfulness was explicitly identified as the central therapeutic component and the intervention duration was a minimum of four weeks, and it included only studies that used validated scales for the measurement of psychological distress outcomes. The outcome measures examined were psychological distress.

It included 19 controlled and uncontrolled intervention studies with a total of 1,139 participants. The analyses yielded medium-to-large mean effect sizes for the within-group (pre-post) comparison (Hedges's  $g = 0.68$ , 95 % confidence interval (CI) [0.58, 0.78]) and for the between-group (Hedges's  $g = 0.68$ , 95 % CI [0.48, 0.88]) comparison of MBI with an inactive control.

Effectiveness was largely maintained at a median follow-up of 5 weeks (Hedges's  $g = 0.60$ , 95 % CI [0.46, 0.75]). Analyses based on subgroup comparisons suggested that brief versions of mindfulness-based stress reduction developed for organisational settings are equally effective as standard 8-week versions originally developed for clinical settings. Virgili (2015) concludes there is little evidence to suggest that MBIs are more effective than other types of occupational stress management interventions, such as relaxation training and yoga, for reducing psychological distress in working adults and finds that “Overall, these findings support the use of MBIs in organisational settings for the reduction of psychological distress.”

A systematic review of *job-stress interventions* literature by Lamontagne et al. (2007) categorised ninety reports by the degree of systems approach used with ratings from low (individual focused only), moderate (organisational focused only), and high (both individual and organisationally focused). They examined for reporting of favourable changes at the individual and the organisational level. Individual level outcomes include somatic symptoms, physiologic changes (e.g., blood pressure, cholesterol levels), skills (e.g., coping ability), and psychological outcomes (e.g., general mental health, anxiety). Organisational level outcomes include working conditions as well as those traditionally referred to as such: absenteeism, employee turnover, injury rates, and productivity.<sup>16</sup>

They found that “Individual-focused, low-rated approaches are effective at the individual level, favorably affecting individual-level outcomes [in 35 out of 41 studies], but tend not to

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<sup>16</sup> Lamontagne et al. (2007) does not report results at the level of specific outcomes, e.g. stress or anxiety. It is included in this section rather than the anxiety and depressive symptoms section as the focus is on “job-stress interventions” and the authors search terms all related to stress e.g. “occupational stress”, “job stress”, “work stress” and “stress management”.

have favorable impacts at the organizational level [4 out of 13 studies]. Organizationally-focused high- and moderate-rated approaches are beneficial at both individual [high: 21 out of 25 studies; moderate: 9 out of 10 studies] and organizational levels [high: 28 out of 29 studies; moderate: 12 out of 16 studies].” They also note that “restriction of summary analyses to four-star [study with pre and post measures and a control group but without randomization] and five-star [study with pre and post measures and a randomized control group] studies confirmed that inclusion of the lower-causal-inference (three-star) studies did not bias the conclusions.”

Gravelling et al. (2009) undertook a systematic review of workplace interventions that promote mental wellbeing in the workplace as background research to the NICE guidance on mental wellbeing in work.<sup>17</sup> They reviewed 66 primary studies. A broad range of interventions were identified and were evaluated according to whether they were organisational interventions or stress management interventions. The “evidence statements” made in relation to stress management interventions are presented below.

- Training to cope with stress: Eight studies that were graded positively evaluated different types of stress-management training. Six studies found a positive impact on mental wellbeing as measured by questionnaire. One Australian randomised trial found a positive effect that was close to being statistically significant but not quite (Lindquist et al, 1999 ++), and one study with 54 volunteer German bus drivers (Aust et al 1997) found no significant effects. The differences amongst studies in interventions, populations and study quality mitigate against definitive conclusions. However there is reasonable evidence that multi-faceted training, covering stress awareness, coping and stress reduction is an effective format. Six of the eight studies had training programmes involving a trainer or facilitator, of which four found a positive impact on mental

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<sup>17</sup> The second evidence review, *Mental wellbeing through productive and healthy working conditions* by Baxter et al., (2009), produced as part of the background to the NICE Guidance on *Mental Wellbeing at Workplace* did not examine interventions and so it is not included in this Review. It was a thematic review to identify characteristics of work content and work context that can act as stressors. It examined associations between work and mental wellbeing, and identified two organisational sources of stress: work context and work content. Work context factors include management style, organisational justice, workplace support, participation and communication. Work content factors include work demand over level of control, effort and reward, role, working schedule, sense of fulfilment, and job stability. It notes that these characteristics interrelate with employees’ attributes. The extent to which an employee experiences stress is dependent on their own resources and capacity as well as the adequacy of support and supervision. It notes that three theoretical models underpin much of the evidence on the associations between workplace and psychological outcomes. Namely, the effort–reward balance model, the demand–control model and the model of organisational justice. A brief report *Supplementary information to final review* by Baxter et al (2009) was also produced as background work to the above NICE guidance; it did not examine interventions so is not included in this Review.

wellbeing, again measured by questionnaire. Two small randomised control trials (Horan et al. 2002 +) and (Rahe et al. 2002 +) found that small group sessions have a positive impact on mental wellbeing. There is evidence from one randomised trial undertaken in the USA (Cook 2007++), comparing web materials with paper-based materials, that paper-based training materials are more effective for improving mental wellbeing. [Evidence Statement 5]

- Counselling and therapy: A UK randomised control trial (Bond and Bunce 2000 +) with 90 volunteers from a media company found that three half-day sessions of therapy and counselling delivered during work time had a positive impact on mental wellbeing in the short term, as measured by questionnaire. A UK randomised trial with 24 cases and 24 controls who were NHS and Local Authority workers with 10 or more days absence due to stress, anxiety or depression in the previous 6 months (Grime et al. 2004 +) found that eight weekly sessions using a computerised Cognitive Behavioural Therapy programme had a positive impact on mental wellbeing in the short term as measured by questionnaire. [Evidence Statement 6]

Exercise and relaxation interventions: A randomised trial comparing aerobic and nonaerobic exercise (Altchiler and Motta, 1994+) found that aerobic exercise had a positive impact on anxiety and other questionnaire-based stress measures. A randomised control trial with Australian casino workers evaluated a 24 week out of work time programme which combined aerobic exercise (moderate to high intensity) for 20 minutes on three days per week; weight-training (light to moderate intensity) at least twice a week; and behaviour modification interventions (health education seminars and health counselling), found mental health and other health benefits when measured at the end of the programme. There is currently insufficient research available to support the use of relaxation training to improve mental wellbeing; further research is required. There is currently insufficient evidence to support the use of massage therapy in promoting mental wellbeing; further research is required. One US randomised trial comparing transcendental meditation with a more conventional stress management programme (Sheppard et al. 1997 +) found a positive impact on mental wellbeing in the longer term; further research is required. [Evidence Statement 7]

- Health promotion interventions: A randomised control trial undertaken in Sweden (Hasson et al. 2005 ++) with 129 cases and 174 controls drawn from volunteers working for a IT and media company found that a web-based health promotion and lifestyle training package can improve mental wellbeing as measured using a non-standard questionnaire at baseline, and at 6 months after the web site and related components being available. [Evidence Statement 8]

Gravelling et al. (2009) conclude: “There are many published papers relating to the general area of interventions intended to improve mental wellbeing in the workplace. These cover a wealth of different interventions and outcomes, reflecting a general imprecision in the descriptive terms used. Despite numerous methodological difficulties and shortcomings, enough of these papers are of adequate quality to suggest that there might well be tangible benefits from such interventions, although generally speaking the papers are not of sufficient quality or number to be able to make unequivocal evidence statements. It is hoped that it will be possible to build on the research base identified to provide clearer evidence in the future.”

The British Occupational Health Research Foundation (BOHRF, 2005) undertook a systematic review of evidence of workplace interventions for common mental health problems. In relation to the effectiveness of stress management interventions they conclude: “There was moderate evidence that stress management programmes in the workplace might have at best a modest or short-term impact on a range of variables associated with individual stress.”

### Selective

#### ***Healthcare workers***

Ruotsalainen et al. (2015) conducted a meta-analysis to evaluate the effectiveness of work- and person-directed interventions compared to no intervention or alternative interventions in *preventing stress at work in healthcare workers*. They examined randomised controlled trials (RCTs) of interventions aimed at preventing psychological stress in healthcare workers and for organisational interventions included interrupted time-series and controlled before-and-after (CBA) studies.

They analyse 58 studies (54 RCTs and four CBA studies). They categorise interventions as cognitive-behavioural training (n = 14), mental and physical relaxation (n = 21), combined CBT and relaxation (n = 6) and organisational interventions (n = 20). Outcomes are categorized as stress, anxiety or general health with follow-up less than one month in 24 studies, one to six months in 22 studies and more than six months in 12 studies. They found that

- **Cognitive-behavioural training (CBT):** There was low-quality evidence that CBT with or without relaxation was no more effective in reducing stress symptoms than no intervention at one month follow-up in six studies (SMD -0.27, 95% Confidence Interval (CI) -0.66 to 0.13; 332 participants). But at one to six months follow-up in seven studies (SMD -0.38, 95% CI -0.59 to -0.16; 549 participants, 13% relative risk reduction), and at

more than six months follow-up in two studies (SMD -1.04, 95% CI -1.37 to -0.70; 157 participants) CBT with or without relaxation reduced stress more than no intervention. CBT interventions did not lead to a considerably greater effect than an alternative intervention, in three studies.

- **Physical relaxation:** Physical relaxation, for example massage, was more effective in reducing stress than no intervention at one month follow-up in four studies (SMD -0.48, 95% CI -0.89 to -0.08; 97 participants) and at one to six months follow-up in six studies (SMD -0.47; 95% CI -0.70 to -0.24; 316 participants). Two studies did not find a considerable difference in stress reduction between massage and taking extra breaks.
- **Physical relaxation:** Mental relaxation, for example meditation, led to similar stress symptom levels as no intervention at one to six months follow-up in six studies (SMD -0.50, 95% CI -1.15 to 0.15; 205 participants) but to less stress in one study at more than six months follow-up. One study showed that mental relaxation reduced stress more effectively than attending a course on theory analysis and another that it was more effective than just relaxing in a chair.

Ruotsalainen et al. (2015) conclude that “there is low-quality evidence that CBT and mental and physical relaxation reduce stress more than no intervention but not more than alternative interventions. There is also low-quality evidence that changing work schedules may lead to a reduction of stress. Other organisational interventions have no effect on stress levels.”

Ruotsalainen et al. (2008) conducted an earlier meta-analysis of the effectiveness of interventions in *reducing stress* at work among *health care workers*. They analysed nineteen studies on reducing stress or burnout (14 RCTs, 3 cluster-randomized trials, and 2 crossover trials) and found:

- Person-directed interventions can reduce stress [standardized mean difference (SMD) -0.85, 95% confidence interval (95% CI) -1.21--0.49] and burnout, measured as emotional exhaustion [weighted mean difference (WMD) -5.82, 95% CI -11.02--0.63] and lack of personal accomplishment (WMD -3.61; 95% CI -4.65--2.58). They also reduce anxiety, measured as state anxiety (WMD -9.42, 95% CI -16.92--1.93) and trait anxiety (WMD -6.91, 95% CI -12.80--1.01).
- Person-work interface interventions can reduce burnout, measured as depersonalization [mean difference (MD) -1.14, 95% CI -2.18--0.10].
- Organizational interventions can also reduce stress symptoms (MD -0.34; 95% CI -0.62--0.06) and general symptoms (MD -2.90, 95% CI -5.16--0.64). No harmful effects were reported.

Ruotsalainen et al. (2008) conclude: “limited evidence is available for a small, but probably relevant reduction in stress levels from person-directed, person-work interface interventions, and organizational interventions among health care workers. This finding should lead to a more-active stress management policy in health care institutions. Before large-scale implementation can be advised, larger and better quality trials are needed.”

### **Teachers**

Naghieh et al. (2015) undertook a systematic review of *organisational interventions* for improving *wellbeing* and reducing work-related *stress* in *teachers*. The selection criteria were randomised controlled trials (RCTs), cluster-RCTs, and controlled before-and-after studies of organisational-level interventions for the wellbeing of teachers. Four studies met the inclusion criteria, 3 cluster-randomised controlled trials and 1 with a stepped-wedge design. They found::

- Changing task characteristics: One study with 961 teachers in eight schools compared a task-based organisational change intervention along with stress management training to no intervention. It found a small reduction at 12 months in 10 out of 14 of the subscales in the Occupational Stress Inventory, with a mean difference (MD) varying from -3.84 to 0.13, and a small increase in the Work Ability Index (MD 2.27; 95% confidence interval (CI) 1.64 to 2.90; 708 participants, low-quality evidence).
- Changing organisational characteristics: Two studies compared teacher training combined with school-wide coaching support to no intervention. One study with 59 teachers in 43 schools found no significant effects on job-related anxiety (MD -0.25 95% CI -0.61 to 0.11, very low-quality evidence) or depression (MD -0.26 95% CI -0.57 to 0.05, very low-quality evidence) after 24 months. The other study with 77 teachers in 18 schools found no significant effects on the Maslach Burnout Inventory subscales (e.g. emotional exhaustion subscale: MD -0.05 95% CI -0.52 to 0.42, low-quality evidence) or the Teacher Perceived Emotional Ability subscales (e.g. regulating emotions subscale: MD 0.11 95% CI -0.11 to 0.33, low-quality evidence) after six months.

Naghieh et al. (2015) conclude: “we found low-quality evidence that organisational interventions lead to improvements in teacher wellbeing and retention rates. We need further evaluation of the effects of organisational interventions for teacher wellbeing. These studies should follow a complex-interventions framework, use a cluster-randomised design and have large sample sizes.”

### **Nurses**

Mimura and Griffiths (2003) undertook a systematic review of current approaches to *workplace stress management for nurses*. Seven randomised controlled trials and three prospective cohort studies assessing the effectiveness of stress management programmes were identified and reviewed. The quality of research identified was judged to be weak.

They found that among the response support interventions (approaches that aim to support personnel to deal effectively with a variety of stressful situations), one approach focusing on cognitive techniques was determined to be effective, although evidence was weak; three approaches using exercise, music, and relaxation training were potentially effective; one approach using social support education was questioned but possibly effective; and for two of them it was impossible to draw conclusions after the critical appraisals. One auxiliary study using cognitive education and role playing allowed no conclusion. One study focusing on environmental change (introducing different nursing methods) provided no evidence of effectiveness (non-significant results), although findings tended to favour the intervention and so the study is classified as possibly effective. With regard to the auxiliary studies, one approach changing nursing method (environmental change) was potentially effective and one further study allows no conclusion to be drawn.

Mimura and Griffiths (2003): “It is not possible to recommend any particular approach for practical implementation because the number of studies is too small to determine it. However, there is more evidence for the effectiveness of personnel support than environmental management. Moreover, all programmes reviewed here appeared at least not harmful. Further research is definitely needed, specifically RCTs or PCSs with rigour.”

### **Mental health field**

Edwards et al. (2002) conducted a systematic review of the effectiveness of stress management interventions for those working in the mental health field. Research articles from 1966 to 2000 which reported studies undertaken in the United Kingdom and which specifically identified participants as mental health workers were included in the review. Studies from other European countries and from the USA were examined as potential models of good practice. The authors note that the review demonstrated that a great deal is known about the sources of stress at work, about how to measure them and about their interaction and impact on a range of outcome indicators. What was found to be lacking was a translation of these results into practice, into research that assessed the impact of interventions that attempted to moderate, minimize or eliminate some of these stressors. Three papers were retrieved which reported intervention strategies for workers classified as

working within the mental health arena. The review does not state a clear conclusion in relation to effectiveness.

### **Multiple**

The British Occupational Health Research Foundation (BOHRF, 2005) undertook a systematic review of evidence of workplace interventions for common mental health problems. In relation to effectiveness of interventions for at risk occupations, they found strong evidence for healthcare professionals, limited evidence for teachers and no evidence for social workers (on study only).

## **B.7 Anxiety and Depression Interventions**

### **Universal**

#### ***Anxiety and Depressive Symptoms***

As noted in Chapter 8, Richardson and Rothstein (2008) conducted a meta-analysis of effects of *occupational stress management intervention programs*. A total of 36 experimental studies were included, representing 55 interventions. Focusing just on their findings for anxiety and mental health they found favourable effects on both; moderate effect size ( $d = 0.678$ ) for anxiety outcomes and small to moderate effect size ( $d = 0.441$ ) for other mental health measures.

The above-mentioned study was an update on a study by van der Klink et al. (2001) which also included stress. The earlier meta-analysis by van der Klink et al. (2001), examined data from 48 interventions published in 45 articles between 1977 and 1996. They found “a small but significant overall effect ( $d = 0.34$ )”.

Four intervention types were distinguished: cognitive-behavioral interventions, relaxation techniques, multimodal programs, and organization-focused interventions. They found “a moderate effect was found for cognitive-behavioral interventions ( $d = 0.68$ ) and multimodal interventions ( $d = 0.51$ ), and a small effect was found for relaxation techniques ( $d = 0.35$ ). The effect size for organization-focused interventions was non-significant ( $d = 0.08$ ).” They report that effects were most pronounced on the following outcome categories: complaints, psychologic resources and responses, and perceived quality of work life. van der Klink et al. (2001) conclude that “Stress management interventions are effective. Cognitive-behavioral interventions are more effective than the other intervention types.”



Outcome variables included a number of categories as shown below. Favourable effects on anxiety symptoms were reported for all intervention categories (apart from organisational where no studies focused on that outcome) and depressive symptoms for individual focused and multimodal interventions.

Outcome	Organizational		Cognitive–Behavioral		Relaxation		Multimodal		Individual Focus (Summation)		
	<i>d</i>	No. of Studies	<i>d</i>	No. of Studies	<i>d</i>	No. of Studies	<i>d</i>	No. of Studies	<i>d</i>	No. of Studies	No. of Participants
Quality of work	0.05	4	0.48***	7	0.29**	8	0.59**	2 <sup>a</sup>	0.41***	17	708
Psychologic responses and resources	0.14**	1	0.65***	10 <sup>a</sup>	0.26*	5	0.22	1	0.48***	16 <sup>a</sup>	915
Physiology	...	0	0.11	2	0.31***	10	0.36*	3	0.30***	15	808
Complaints	0.05	4	0.52***	14 <sup>a</sup>	0.31***	14	0.48***	6	0.42***	34 <sup>a</sup>	1923
Anxiety symptoms	...	0	0.70***	7	0.25*	7	0.50***	4	0.54***	18	871
Depressive symptoms	0	1	0.23	2	0.11	2	0.59***	2	0.33**	6	392
Absenteeism	0	1	-0.18	1	-0.09	2	...	0	-0.12	3	121

<sup>a</sup>Heterogeneous effect.  
\**P* < .05; \*\**P* < .01; \*\*\**P* < .001.

Tan et al. (2014) undertook a systematic search for and meta-analysis of randomized controlled trials of workplace interventions aimed at *universal prevention of depression*. They found nine workplace-based randomized controlled trials (RCT), the majority of the included studies utilized cognitive behavioral therapy (CBT) techniques. The overall standardized mean difference (SMD) between the intervention and control groups was a small positive effect of 0.16 (95% confidence interval (CI): 0.07, 0.24, *P* = 0.0002). A separate analysis using only CBT-based interventions yielded a significant SMD of 0.12 (95% CI: 0.02, 0.22, *P* = 0.01).

Tan et al. (2014) conclude: “There is good quality evidence that universally delivered workplace mental health interventions can reduce the level of depression symptoms among workers. There is more evidence for the effectiveness of CBT-based programs than other interventions. Evidence-based workplace interventions should be a key component of efforts to prevent the development of depression among adults.”

Vanhove et al. (2016) undertook a meta-analysis summarizing the effectiveness of resilience-building programmes implemented in organizational contexts. They used 42 independent samples across 37 studies.

They found the overall effect of such programmes to be small (*d*=0.21). The sample size-corrected effect across independent samples and time points was *d* = 0.21 (95% CI [0.13, 0.29], *k* = 42, *n* = 16,348). The positive directionality indicates participants in resilience-building programmes improved scores on performance and well-being outcomes and reduced scores on outcomes reflecting psychosocial deficits upon post-training assessment.

The CIs' exclusion of zero indicates the effect of these programmes was statistically significant.

Programme effects diminish over time ( $d(\text{proximal, i.e. } \leq 1 \text{ month post-intervention})=0.26$  vs.  $d(\text{distal})=0.07$ ). Alternatively, moderator analyses revealed that programmes targeting individuals thought to be at greater risk of experiencing stress and lacking core protective factors showed the opposite effect over time. Programmes employing a one-on-one delivery format (e.g., coaching) were most effective, followed by the classroom-based group delivery format. Programmes using train-the-trainer and computer-based delivery formats were least effective. Substantially stronger effects were observed among studies employing single-group within-participant designs (which compare participants at different time points) in comparison to studies utilizing between-participant designs (which compare outcomes across participants in treatment and control groups).

They also examined the effects of resilience-building programmes on specific types of outcomes and found:

- Performance outcomes (e.g., supervisor-rated performance, successful task completion) were favourable but diminished. At or within one month of the intervention effect size was  $d= 0.36$  (95% CI [0.21, 0.50]) and after this period  $d = 0.03$  (95% CI [-0.01, 0.07]).
- Psychological deficits outcomes (e.g., anxiety, depression) were favourable and sustained. At or within one month of the intervention  $d= 0.17$  (95% CI [0.03, 0.32]) and after this period  $d = 0.10$  (95% CI [0.03, 0.17]).
- Wellbeing outcomes (e.g., positive affect, purpose in life, subjective well-being) were favourable but diminished. At or within one month of the intervention  $d= 0.25$  (95% CI [0.15, 0.34]) and after this period  $d = 0.06$  (95% CI [-0.05, 0.17]).

Vanhove et al. (2016) conclude that "Taken together, these findings provide important theoretical and practical implications for advancing the study and use of resilience-building in the workplace."

Robertson et al. (2014) undertook a systematic review of work-based *resilience training interventions*. The primary aim of this review was to examine the effect of resilience training on personal resilience and four broad categories of dependent variables relating to mental health and subjective well-being outcomes, physical/ biological outcomes, psychosocial outcomes, and performance outcomes. It identified 14 studies. Statistically significant results and (non-significant) medium–large effect sizes for the dependent variables in each study are noted below.

- Mental health and subjective well-being outcomes: This is the most frequently studied category of outcome and the most frequently studied outcomes were depression, stress, negative mood/affect/emotion, and anxiety. A sample-size-weighted mean effect size based on the 13 effect sizes available for this cluster of variables gives a value of  $d = 0.78$  (a large effect). It was not possible to examine the impact of follow-up period in our study, but it is something that should be a point of focus for future research.
- Psychosocial outcomes: The majority of the studies also investigated psychosocial outcomes. Three such studies measured self-efficacy, with all showing a positive effect. Results for other psychosocial outcomes (e.g., work satisfaction, social skills) were generally in the direction of a beneficial effect, but most of the effect sizes were too small to reach statistical significance, given the sample sizes used in the studies.
- Physical/biological outcomes: Very few of the seven studies that examined these outcomes found statistically significant effects and where they did the effect sizes were small-to-moderate. There were two exceptions: one study showed that resilience training resulted in significantly large reductions in fatigue ( $d = -1.44$ ,  $p < .01$ ) and another showed a significantly large increase in antithrombin ( $d = 1.03$ ,  $p = .04$ ), an anticoagulant helpful in preventing thrombosis.
- Performance outcomes: Six studies examined these outcomes, but there was no common measure across the studies. The two studies that assessed observed performance and goal attainment showed positive trends, with a large effect for both of these variables (viz. Arnetz et al., 2009; Grant et al., 2009). Interestingly, there were contrasting results with regard to productivity. Pipe et al. found that resilience training resulted in significantly higher levels of productivity, whereas McCraty and Atkinson (2012) found that resilience training resulted in (non-significant) moderately lower levels of productivity. Results for more distal outcomes (viz. gross margin and product sold) showed no indication of any effect.

Robertson et al. (2014) conclude: “The findings of this review provide some indication that resilience training for workers may have beneficial consequences. This is especially the case for mental health and subjective well-being outcomes, such as stress, depression, anxiety, and negative mood/affect/emotion, which appear particularly sensitive to resilience intervention. There is also an indication, across the studies, that self-efficacy and personal resilience may be improved following training – as would be expected. However, it is noteworthy that only a few studies measured these outcomes and the results available must thus be interpreted cautiously. This is similarly the case for physical/biological and performance outcomes of which indications of efficacy permit only tentative conclusions (as they rely on single studies for most of the outcomes investigated.”

Michie and Williams (2003) conducted a systematic review of *reducing work-related psychological ill health and sickness absence*. They found that “Successful interventions that improved psychological health and levels of sickness absence used training and organisational approaches to increase participation in decision making and problem solving, increase support and feedback, and improve communication.”

They concluded that “many of the work-related variables associated with high levels of psychological ill health are potentially amenable to change. This is shown in intervention studies that have successfully improved psychological health and reduced sickness absence.”

### ***Suicide prevention***

Milner et al. (2015) provide a systematic assessment of workplace suicide prevention activities, including short-term training activities, as well as suicide prevention strategies designed for occupational groups at risk of suicide identified through peer review databases and a review of websites. They identified 13 interventions relevant for the review after exclusions. There were a few examples of prevention activities developed for at-risk occupations (e.g. police, army, air force and the construction industry) as well as a number of general awareness programmes that could be applied across different settings. They find that very few workplace suicide prevention initiatives had been evaluated, but the results from those that had been evaluated suggest that prevention initiatives had beneficial effects.

Milner et al. (2015) conclude that “Suicide prevention has the potential to be integrated into existing workplace mental health activities. There is a need for further studies to develop, implement and evaluate workplace suicide prevention programmes.”

Joyce et al. (2016) carried out a systematic meta-review of academic and grey literature databases to examine the effectiveness of workplace *mental health interventions* that aim to prevent, treat or rehabilitate *a worker with a diagnosis* of depression, anxiety or both. They found:

- Primary interventions: Enhancing employee control and promoting physical activity were the two primary prevention interventions for which moderate evidence was identified;
- Secondary interventions: Stronger evidence was found for CBT-based stress management although less evidence was found for other secondary prevention interventions, such as counselling. Strong evidence was also found to confirm existing guidance advising against the routine use of either single session or multiple session debriefing following trauma.

- Tertiary interventions: Tertiary interventions with a specific focus on work, such as exposure therapy and CBT-based and problem-focused return-to-work programmes, had a strong evidence base for improving symptomology and a moderate evidence base for improving occupational outcomes.

Joyce et al. (2016) conclude: “Overall, these findings demonstrate there are empirically supported interventions that workplaces can utilize to aid in the prevention of common mental illness as well as facilitating the recovery of employees diagnosed with depression and/or anxiety.”

Dietrich et al. (2012) identify evidence-based indicated/secondary prevention strategies for depression in the workplace. They undertook a systematic review of articles in peer reviewed databases. Studies were selected based on various inclusion criteria, such as diagnosis of depression with validated screening instruments and presence of a control group. A total of 9,173 articles were found but only one met all inclusion criteria, an evaluated intervention study in the workplace (French APRAND programme). This intervention, which combined the provision of diagnosis and psychoeducation, had a positive effect on people with depression, with a significant trend towards chances of recovery or remission after 1 year.

Dietrich et al. (2012) conclude: “The findings are quite sobering given the high prevalence of depression and the individual and societal burden caused by it. More tailor-made interventions in the workplace targeting depression directly are needed.”

Furlan et al. (2012) undertook a systematic review of intervention practices for depression in the workplace. Articles were included that met the following criteria: working age individuals with mild or moderate depression; interventions or programs that were workplace-based or could be implemented and/or facilitated by the employer; inclusion of a comparator group in the analysis; outcomes of prevention, management, and recurrences of work disability or sickness absence, and work functioning. They found 10 randomised trials and 2 non-randomised studies from various countries and jurisdictions that evaluated a wide range of intervention practices. They graded the evidence as "very low" for all outcomes identified and report that therefore, no intervention could be recommended. Furlan et al. (2012) conclude: “To date, there is insufficient quality of evidence to determine which interventions are effective and yield value to manage depression in the workplace.”

## B.8 Workplace Health Promotion Programmes

### Health Only Outcomes

Groeneveld et al. (2010) undertook a systematic review of lifestyle-targeted interventions at the workplace on the main biological risk factors for cardiovascular disease (CVD). They included randomized controlled trials (RCT) that were targeted at workers, aimed at increasing physical activity and/or improving diet and measured body weight, body fat, blood pressure, blood lipids and/or blood glucose. They used a nine-item methodological quality list to determine the quality of each study and applied a best-evidence system, taking into account study quality and consistency of effects.

Their review included 31 RCTs, describing a diversity of interventions (e.g. counselling, group education, or exercise). Of these studies, 18 were of high quality. They note that “Strong evidence was found for a positive effect on body fat, one of the strongest predictors of CVD risk. Among populations “at risk”, there was strong evidence for a positive effect on body weight. Due to inconsistencies in results between studies, there was no evidence for the effectiveness of interventions on the remaining outcomes.”

Groeneveld et al. (2010) conclude: “We found strong evidence for the effectiveness of workplace lifestyle-based interventions on body fat and, in populations at risk for CVD, body weight. Populations with an elevated risk of CVD seemed to benefit most from lifestyle interventions; supervised exercise interventions appeared the least effective intervention strategy. To gain better insight into the mechanisms that led to the intervention effects, the participants' compliance with the intervention and the lifestyle changes achieved should be reported in future studies.”

Aneni et al. (2014) undertook a systematic review of the effectiveness of internet-based employee *cardiovascular wellness and prevention programs*. They report significant differences in intervention types and number of components in each intervention. They included 29 studies, only a few of the studies were conducted in persons at-risk for CVD, none in blue-collar workers or low-income earners.

They note that in general, the interventions could be grouped into largely internet-based programs with minimal interaction with the environment or study personnel (referred to as largely internet based throughout this section), or multi-component interventions in which non-internet features played more than a minor role. Common themes with the largely internet-based studies were provision of access to a web-site and a needs assessment either through questionnaires (health risk assessments, psychosocial assessments, health surveys, etc.) or through monitoring devices such as physical activity monitors or pedometers. Some interventions included the ability to self-monitor progress, email support for reminders or

motivational messages, and social networking (interaction with others in the intervention). The authors do not provide a summary description of the themes of the multi-component interventions. They note that in general there was no clear pattern for the relation between the number of intervention components and the outcome among the internet-based randomized trials. Multi-component studies appeared to be more effective, as all 4 multi-component studies (2 trials and 2 pre-post studies) found significant associations between their intervention and outcomes.

In terms of outcomes they note: “In general, the internet-based studies included in our review did not show consistent improvement in any of the outcomes assessed.” In terms of outcomes categories, they found:

- Physical activity and weight: They found modest improvements were observed in more than half of the studies with weight-related outcomes, while no improvement was seen in virtually all the studies with physical activity outcome. Weight-related and physical activity outcomes were the most examined and thus had the largest number of studies. Our findings show equal number of high quality studies reporting no improvement or some improvement on weight-related changes, however virtually all the high quality randomized trials showed no effect of the interventions on physical activity. Thus, they may conclude that these types of interventions do not improve physical activity and have unpredictable effects on weight management.
- Blood pressure: More studies showed no effect on BP than significant BP reduction. However, we note that that only one study was targeted at persons who were hypertensive and this showed clinically significant reduction in blood pressure. Thus, they conclude that general internet-based wellness interventions (multi-hit programs) may not be effective at BP reduction and that there is insufficient evidence to conclude for or against internet-based interventions targeted at persons with elevated BP/hypertension.
- Blood glucose or HbA1c: There were too few high quality studies examining improvement in blood glucose or HbA1c to comment on the effect of internet-based interventions on these outcomes.
- Lipids: Half of the six high quality studies examining lipid profiles showed no improvement while the other half demonstrated improvement in at least one parameter, thus making conclusions about internet based studies in improving lipid profiles impossible.

- Diet: Among the studies with dietary outcomes the number of high quality studies demonstrating improvements was similar to those with no significant intervention effect (4 vs. 5) making decisive conclusions about the efficacy of internet – based studies on improving diet difficult to reach.
- Smoking: There were too few high quality studies examining smoking cessation to comment on the effect of internet-based interventions on this outcome.

The authors state that the summary is made with caution since they have observed wide differences in intervention design, measured outcomes, populations studied and duration of follow-up in studies included in the review.

They find that, in general, internet-based programs were more successful if the interventions also included some physical contact and environmental modification, and if they were targeted at specific disease entities such as hypertension. Overall, Aneni et al. (2014) conclude: “Internet based programs hold promise for improving the cardiovascular wellness among employees however much work is required to fully understand its utility and long term impact especially in special/at-risk populations.”

Benedict and Arterburn (2008) carried out a systematic review to update a previous systematic review on the effectiveness of interventions relevant to worksite-based weight loss programs.

The outcomes measured were BMI or body weight assessed before and after intervention. A narrative synthesis was provided due to heterogeneity of study designs. 11 randomized controlled trials were included, most of which focused on education and counselling to improve diet and increase physical activity. Single intervention programs included an aerobic exercise training program, a low-calorie diet treatment and a meal replacement regimen. Program duration ranged from 2 to 18 months, with 56% to 100% of subjects completing the studies. The overall methodological quality of the studies was poor. Intervention groups lost significantly more weight than controls, with the mean difference in weight loss ranging from -0.2 to -6.4 kg.

The authors conclude that “worksite-based weight loss programs can result in modest short improvements in body weight; however, long-term data on health and economic outcomes are lacking”, and that “there is a need for rigorous controlled studies of worksite-based interventions that integrate educational, behavioural, environmental, and economic supports.”



Martin et al. (2009) conducted a systematic review and meta-analysis into the effects of *health promotion interventions* in the workplace on *depression and anxiety* symptoms. The inclusion criteria dictated that the studies contained a quantitative evaluation of workplace health interventions reporting outcome on a standardized mental health screening measure for depression or anxiety. The intervention had to target mental health directly or indirectly through a known risk factor for depression or anxiety, such as those reviewed in the introduction (smoking, chronic disease, substance abuse, obesity or inactivity, and poor psychosocial work climate).

The analysis found small, but positive overall effects for symptoms of depression and anxiety in the interventions reviewed, noting that “the interventions with a direct focus on mental health had a similar beneficial effect on symptoms as those with an indirect focus on risk factors” (Martin et al., 2009:14).

This led Martin et al. to conclude that in order to reduce depression and anxiety symptoms “a broad range of interventions using health promotion in the workplace appears to be effective in that those focused directly on symptoms show similar results to those that reduce symptoms indirectly by focusing on risk factors” (Martin et al., 2009: 15).

Montano et al. (2014) undertook a systematic review of *organisational-level workplace interventions* aiming to *improve employees' health*. Literature was retrieved through both electronic database searches and manual searches<sup>18</sup>. To improve comparability of the widely varying studies they classified the interventions according to the main approaches towards modifying working conditions. Based on this classification, they applied a logistic regression model to estimate significant intervention effects.

They found that about half of the studies (19) reported significant effects. Favourable health outcomes were reported for self-rated mental and general health, and for reduction of injury rates. They also found that there was a marginally significant probability of reporting effects among interventions targeting several organisational-level modifications simultaneously (Odds Ratio (OR) 2.71; 95% CI 0.94-11.12), compared to those targeting one dimension only.

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<sup>18</sup> The review was not specific to stress, review was based on two main criteria: (1) organisational-level interventions at the primary prevention level, and (2) studies aiming to improve health-related outcomes. The review is included in this section because (a) when reporting on outcomes the review notes favourable results were reported for “*self-rated mental* and general health, and for reduction of injury rates” and (b) the “discussion” section primarily compares the reviews results to other studies on stress.

Montano et al. (2014) conclude that “Despite the heterogeneity of the 39 organisational-level workplace interventions underlying this review, we were able to compare their effects by applying broad classification categories. Success rates were higher among more comprehensive interventions tackling material, organisational and work-time related conditions simultaneously. To increase the number of successful organisational-level interventions in the future, commonly reported obstacles against the implementation process should be addressed in developing these studies.”

Soler et al. (2010) undertook a systematic review of interventions for worksite health promotion that use an Assessment of Health Risks with Feedback (AHRF) both alone and in combination with other intervention components (AHRF Plus). Other components include health education, enhanced access to physical activity, nutrition, medical care, and a form of incentive or competition for achievement of a programme goal. Effectiveness was assessed on the basis of changes in health behaviours and psychological estimates, but was also informed by changes in risk estimates, healthcare service use and worker productivity. The authors reviewed 51 studies and the health behaviours of interest were alcohol use, diet, physical activity, seat belt use and tobacco use.

The authors conclude, in relation to all outcomes for AHRF intervention alone, that although many of the results are in favour of the intervention, most effect sizes were small or modest in size and came from simple before-and-after studies that were susceptible to several potential sources of bias: “Because of small to moderate effect estimates, inconsistent findings for some outcomes, and the large number of potential threats to the validity in this body of evidence, it is difficult to draw conclusions regarding the effectiveness of this intervention for the wide range of outcomes presented here.”

The authors conclude, in relation to all outcomes for AHRF Plus (i.e. AHRF with additional interventions, e.g. health education) that there was “strong or sufficient evidence” for meaningful effects of AHRF Plus on many outcomes, including tobacco use, alcohol use, seatbelt non-use, dietary fat intake and blood pressure cholesterol. The authors determine “there was insufficient evidence to determine effectiveness for intake of fruits and vegetables, body composition, . . . due to a combination of small and inconsistent effect estimates”.

Overall, the authors conclude that AHRF is useful as “a gateway intervention to a broader worksite health promotion program that includes health education lasting at least 1 hour or repeating multiple times during one year, and that may include an array of health promotion activities. The specific magnitude of an effect an employer might expect from implementing different types of health promotion programs will vary and may be influenced by contextual factors such as type and duration of intervention component offered,

participation rates, participant characteristics... results of this review suggest that this intervention [AHRF] may be more effective for some outcomes (e.g., smoking behaviour or cholesterol) than for others (e.g., change in body composition).”

Engbers et al. (2005) undertook a systematic review of *worksite health promotion programmes (WHPP) with environmental modifications* on physical activity, dietary intake, and health risk indicators. It included articles published up to January 2004 and the inclusion criteria were (randomized) controlled trial (RCT/CT), interventions included environmental modifications, the main outcomes included physical activity, dietary intake, and health risk indicators, and the focus was on healthy working populations.

They found thirteen relevant trials, all studies aimed to stimulate healthy dietary intake, and three trials focused on physical activity. Follow-up measurements of most studies took place after an average 1-year period. They judged the methodological quality of most trials to be poor but found:

- dietary intake: strong evidence for an effect on dietary intake,
- physical activity: inconclusive evidence for an effect on physical activity,
- risk indicators: no evidence for an effect on health risk indicators.

Engbers et al. (2005) conclude: “It is difficult to draw general conclusions based on the small number of studies included in this review. However, evidence exists that WHPPs that include environmental modifications can influence dietary intake. More controlled studies of high methodologic quality need to be initiated that investigate the effects of environmental interventions on dietary intake and especially on physical activity in an occupational setting.”

### Economic or Organisational Outcomes Only

Parks and Steelman (2008) conducted a meta-analysis on studies that examined the effects of participation in an *organizational wellness programmes* on absenteeism and job satisfaction. Organizational wellness programs are defined as on or off-site services sponsored by organizations which attempt to promote good health or to identify and correct potential health-related problems. They categorize the programmes into three groups: educational only, fitness only and comprehensive.

They include 17 studies (15 published studies and 2 dissertations) in the meta-analysis, yielding 7,705 individuals with absenteeism data and 2,480 with job satisfaction data. For absenteeism, the mean effect size was  $-.30$  ( $p < .00$ ) with a confidence interval of  $-.48$  to  $-.22$ , which indicates that participation in a wellness program was associated with lower

absenteeism. For job satisfaction, the mean effect size was moderate (Cohen, 1969;  $d=.42$ ,  $p <.03$ ) with a confidence interval of .05 to .80, indicating those participating in wellness programs tend to report higher job satisfaction.

The authors note that “organizations incur substantial costs when implementing and running wellness programs” and that “given the wide confidence intervals in the current meta-analysis, practitioners should be conservative in their estimate of the amount of gain associated with organizational wellness programs as interventions aimed at reducing absenteeism and improving job satisfaction.”

The authors also note that a potential limitation of their review was that 8 of the 15 studies evaluated volunteers who participated in wellness programs, therefore the studies may have investigated individuals who are otherwise physically active. They suggest that a key question for future research is the issue of participation in such programs.

Parks and Steelman (2008) conclude: “the results revealed that participation in an organizational wellness program was associated with decreased absenteeism and increased job satisfaction. The type of wellness program (fitness only or comprehensive) and the methodological rigor of the primary studies were examined as moderators; however, no moderating effects were found. These results provide some empirical support [the effect sizes are moderate] for the effectiveness of organizational wellness programs.”

Cancelliere et al. (2011) carried out a systematic review, the primary aim of which was to investigate whether *workplace health promotion programmes* (WHPP) are effective at improving presenteeism in workers. The secondary objectives were to identify characteristics of successful programs and potential risk factors for presenteeism. They included any WHPP aimed at promoting health and wellness, or reducing the risk of ill-health.

The criteria for inclusion were original research that contained data on at least 20 participants and examined the impacts of WHP programs implemented at the workplace. Heterogeneity between the studies made it difficult to compare them and a qualitative synthesis rather than a meta-analysis was performed. Interventions were deemed successful if they improved the outcome of interest. Their program components were identified, as were possible risk factors contributing to presenteeism.

They include 14 studies. Ten interventions showed ‘preliminary evidence’ of positive effects on presenteeism, with strong evidence in two of the studies, the first involving worksite exercise, and the second investigating the impact of a supervisor education program regarding mental health promotion. The remaining eight studies provided moderate

evidence of positive intervention effects. These interventions were: “A Lifestyle Intervention Via Email” (*Alive!*), extra rest break time for workers engaged in highly repetitive work, a multi-disciplinary occupational health program, a multi-component health promotion program, participatory processes, exposure to blue-enriched light (vs. white light) and a telephone intervention for depressed workers.

Overall, the authors found that “successful programs provided organizational leadership, health risk screening, individually tailored programs, and a supportive workplace culture. Potential risk factors contributing to presenteeism included being overweight, a poor diet, a lack of exercise, high stress, and poor relations with co-workers and management.”

The authors comment that the amount of primary evidence was limited, due to the inadmissibility of a large number of reviewed studies because of risk of bias, particularly in relation to presenteeism measurement and conclude that “there is preliminary evidence that some WHP programs can positively affect presenteeism and that certain risk factors are of importance”. They suggest that “future research would benefit from standard presenteeism metrics and studies conducted across a broad range of workplace settings”.

Odeen et al. (2013) carried out a systematic review of the general effectiveness of *active workplace interventions* at preventing and reducing sickness absence. The term ‘active interventions or treatments’ refers to interventions requiring that the subject is active and where the goal is behavioural change. Intervention types were cognitive (including stress management training, CBT, counselling on PA and lifestyle, participatory problem solving training, brief cognitive intervention; educational (including education about PA and work style, information booklets, education in lifting techniques); composite interventions (education, exercise and ergonomic advice; back school, multidisciplinary treatment, ergonomic screening, ‘therapeutic RTW’ i.e. Sheerbrooke model); and physical activity interventions.

Quantified sickness absence and/or return to work (RTW) were the only outcome measures. A narrative synthesis was used. Seventeen articles were included (2 with low and 15 with medium risk of bias), with a total of 24 comparisons.

Overall, Odeen et al. (2013) found that “active WP interventions do not seem to be generally effective in reducing sickness absence. However, there is moderate evidence that graded activity reduces sickness absence and limited evidence that the Sheerbrooke model [a comprehensive intervention including both workplace adjustment and a clinical component] and cognitive behavioural therapy reduce sickness absence”.

## Multiple Category Outcomes

Rongen et al. (2013) undertook a meta-analysis of *workplace health promotion programs* (WHPPs) aimed at smoking cessation, physical activity, healthy nutrition, and/or obesity on self-perceived health, work absence due to sickness, work productivity, or work ability. Studies were included if quantitative information was present to calculate an effect size (ES). They identified RCTs published before June 2012 and included 18 studies describing 21 interventions. The focus of programmes included physical activity, weight, nutrition and physical activity, and lifestyle.

Rongen et al. (2013) find the overall effect of a WHPP was small across all outcome measures (ES=0.24, 95% CI=0.14, 0.34). In the analyses stratified by outcome, comparable effects of the WHPPs were found for self-perceived health (ES= 0.23, 95% CI 0.13, 0.33); sickness absence (ES= 0.21, 95% CI 0.03, 0.38); productivity at work (ES=0.29, 95% CI 0.08, 0.51); and work ability (ES= 0.23, 95% CI -0.07, 0.52).

They find that the effectiveness of a WHPP was larger in younger populations, in interventions with weekly contacts, and in studies in which the control group received no health promotion. A 2.6-fold lower effectiveness was observed for studies performing an intention-to-treat analysis and a 1.7-fold lower effectiveness for studies controlling for confounders. Studies of poor methodologic quality reported a 2.9-fold higher effect size of the WHPP.

Rongen et al. (2013) conclude: “The effectiveness of a WHPP is partly determined by intervention characteristics and statistical analysis. High-quality RCTs reported lower effect sizes. It is important to determine the effectiveness of WHPPs in RCTs of high quality.”

Kuoppala et al. (2008) undertook a meta-analysis of studies on work health promotion (WHP) and job well-being, work ability, absenteeism and early retirement. The interventions reviewed were characterised as educational, exercise, psychological, ergonomics and lifestyle. They found:

- Sickness absences: There is moderate evidence that work health promotion decreases sickness absences, risk ratio 0.78; range, 0.10 to 1.57
- Work ability: There is moderate evidence that work health promotion improves work ability, risk ratio 1.38; range, 1.15 to 1.66.
- Mental well-being: Work health promotion seems to increase mental well-being, risk ratio 1.39; range, 0.98 to 1.91.

- Physical well-being: Work health promotion does not seem to improve physical well-being.
- Disability pension: There is no evidence of effects on disability pension.

The authors note that exercise seems to increase overall well-being (RR, 1.25; range, 1.05 to 1.47) and work ability (RR, 1.38; range, 1.15 to 1.66), but education and psychological methods do not seem to affect well-being or sickness absences. Sickness absences seem to be reduced by activities promoting healthy lifestyle (RR, 0.80; range, 0.74 to 0.93) and ergonomics (RR, 0.72; range, 0.13 to 1.57).

Kuoppala et al. (2008) conclude: “Work health promotion is valuable on employees' well-being and work ability and productive in terms of less sickness absences. Activities involving exercise, lifestyle, and ergonomics are potentially effective. On the other hand, education and psychological means applied alone do not seem effective. Work health promotion should target both physical and psychological environments at work.”

Osilla et al. (2012) carried out a systematic review to analyse the impact of *worksite wellness programmes* on health and financial outcomes, and the effect of incentives on participation.

They include 33 studies evaluating 63 outcomes. The most common outcomes were exercise (n = 13), diet (n = 12), and physiologic markers (n = 12). Others reported on healthcare cost (n = 8), smoking (n = 7), alcohol use (n = 3), absenteeism (n = 4), and mental health (n = 4).

The wellness program modalities comprised self-help and educational materials; individual coaching or counselling; group counselling or classes; health risk assessment; group activities and competitions; web-based programs; changes in physical environment; fitness centre access or membership.

A total of 8 of 13 studies found improvements in physical activity, 6 of 12 in diet, 6 of 12 in body mass index/weight, and 3 of 4 in mental health. A total of 6 of 7 studies on tobacco and 2 of 3 on alcohol use found significant reductions. All 4 studies on absenteeism and 7 of 8 on healthcare costs estimated significant decreases. Only 2 of 23 studies evaluated the impact of incentives and found positive health outcomes and decreased costs. Positive effects were found for three quarters of observational designs compared with half of outcomes in randomized controlled trials.

Osilla et al. (2012) conclude that “the studies yielded mixed results regarding impact of wellness programs on health-related behaviours, substance use, physiologic markers, and cost, while the evidence for effects on absenteeism and mental health is insufficient. The validity of those findings is reduced by the lack of rigorous evaluation designs. Further, the

body of publications is in stark contrast to the widespread use of such programs, and research on the effect of incentives is lacking.”

Montano, Hoven and Siegrist (2014) undertook a *meta-analysis to assess what types of socioeconomic positions (SEP) are being considered in randomized controlled intervention studies and to estimate the moderation of SEP in workplace intervention effects on body mass index (BMI), fruit and vegetable consumption, musculoskeletal symptoms, and job stress.*

A meta-analysis of randomized controlled workplace interventions was undertaken. Studies were classified by participants' SEP. The overall standardized mean difference (SMD) for each outcome was estimated and a random-effects model with SEP as moderating variable was calculated in order to assess intervention effect modification. The review covers 36 studies and 40 reports of intervention effects were considered.

They found that:

- The overall mean differences in the models, without SEP as moderating variable, were significant for all outcomes. There were reductions in BMI (SMD -0.16, 95% confidence interval (95% CI) -0.29- -0.02), self-reported musculoskeletal symptoms (SMD -0.32, 95% CI -0.51- -0.14), and self-reported job stress (SMD -0.37, 95% CI -0.71- -0.04), whereas daily consumption of fruit and vegetables increased (SMD 0.12, 95% CI 0.01-0.22).
- There were no statistically significant differences between occupational classes for the health outcomes considered - effect modification (EM):
  - BMI: SMD -0.102 (95% CI -0.264-0.060), EM -0.141 (95% CI -0.406-0.125);
  - Fruit/vegetables: SMD 0.117 (95% CI -0.049-0.282), EM 0.000 (95% CI -0.230-0.231);
  - Musculoskeletal stress: SMD -0.301 (95% CI -0.494 -0.107), EM -0.369 (95% CI -1.169-0.430);
  - Perceived stress: SMD -0.200 (95% CI -0.524-0.124), EM -0.598 (95% CI -1.208-0.012).

Montano, Hoven and Siegrist (2014) conclude that “Workplace interventions can achieve small positive effects on major health outcomes. We could not confirm whether these effects are moderated by occupational class.”



## APPENDIX C SUPPLEMENTARY INFORMATION ON COST-EFFECTIVENESS

As noted in Chapter 3, Boyd, Hunt, and Ortiz (2009b) undertook an economic analysis (a modelling study) of public health interventions that promote mental wellbeing in the workplace. They note that the studies included in the effectiveness review (ibid 2009a) considered an extremely varied range of individual-level and organisational-level interventions. The measurement of health outcomes across the studies was equally varied. Despite the number of different outcome measures used, no study measured health effects in terms of QALYs gained. As a consequence, a rather pragmatic approach is adopted for the economic modelling.

The results of the economic analysis are summarised in four “evidence statements” which are presented in the text box below.

### *Evidence Statement 1*

Work-site interventions to promote the mental wellbeing of employees can reduce absence costs by between £145 and £1,295 per affected employee per year, and reduce presenteeism costs by between £350 and £3,865 per affected employee per year. Note: there is considerable uncertainty surrounding the estimated reductions in presenteeism costs.

Such interventions can therefore save employers between £495 and £5,160 per affected employee per year.

### *Evidence Statement 2*

The net-benefit to employers of implementing interventions to promote the mental wellbeing of employees ranges from negative £220 to positive £1,155 per affected employee participating in the programme, incorporating solely the intervention-induced reductions in absence costs.

Including the intervention-induced reductions in presenteeism as well, the net-benefit to employers ranges from positive £130 to positive £5,020 per affected employee participating in the programme.

### *Evidence Statement 3*

For the 3 modelled interventions, ICERs range from about £3,470 per QALY gained to £15,030 per QALY gained. However, these values do not include any benefits accruing to employers due to reductions in absenteeism and presenteeism.

When the benefits of intervention-induced reductions in absenteeism and presenteeism are

included in the cost component of the ICER, the ratios become negative – i.e. relative to the baseline of ‘do nothing’, all 3 modelled interventions are dominant, resulting in reduced costs and increased health benefits.

There is, however, considerable uncertainty surrounding the combining of effectiveness evidence on intervention-induced reductions in absenteeism and presenteeism with effectiveness evidence on intervention-induced QALY gains, since both sets of evidence are sourced from different studies.

#### *Evidence Statement 4*

The net (social) benefit of interventions to promote the mental wellbeing of employees ranges from positive £115 to positive £420 per participating employee. This indicates that such interventions increase total social welfare.

These are conservative estimates, since (i) the value to the employer of intervention-induced reductions in absenteeism and presenteeism are not included and (ii) any savings in NHS resources due to reductions in work-related stress, depression and anxiety are also not included.

There is considerable uncertainty surrounding the estimates, since they are based on a single WTP value from an American stated preference survey.

*Note:* The authors note that to generate (1) incremental cost-effectiveness ratios (ICERs) broadly in line with the NICE reference case, it is necessary to base the analysis on only 3 studies from the effectiveness review (these are shown in the table below), where health outcomes are measured on a scale that can be converted, directly or indirectly, into QALYs gained; and (2) estimates of the net-benefits to employers of work-site interventions that promote mental wellbeing in the workplace, evidence from the effectiveness review and other sources in the literature is used, in conjunction with standard methods to value health-related changes in foregone productivity due to absenteeism and presenteeism. A single willingness-to-pay value from an American study is also used to provide an indication of the net-benefits of interventions to promote the mental wellbeing of employees from a social perspective.

Boyd, Hunt, and Ortiz (2009b) conclude “The results of the economic modelling support the business case for implementing work-site interventions to promote the mental wellbeing of employees. Due to the lack of consistent and robust effectiveness evidence on which to base the economic evaluation, a pragmatic approach to the modelling is adopted. However, this necessitates the adoption of a number of assumptions, which inevitably increases the uncertainty surrounding the results. Consequently, the evidence statements listed above should only be viewed as indicative, and the underlying uncertainty should be taken into account when developing guidelines to promote the mental wellbeing of employees in the workplace.”