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Review

Economic impact of corporate wellness programs in Europe: A literature review

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Abstract: Economic impact of corporate wellness programs in Europe: A literature review: R. Iván Martínez-Lemos. Special Learning Department, University of Vigo, Spain—Objectives: The purpose of this review is to summarize the current evidence on the economic impact of corporate wellness programs (CWPs) in Europe from the results of randomized controlled trials (RCTs) published up to 2013. **Methods:** A review was undertaken by searching for RCTs with key words in the following databases: PubMed, SPORTDiscus, and Business Source Premier. Only RCTs that evaluated the economic impact of CWPs, and included analyses performed in Europe with results converted into monetary values, were eligible for inclusion. An approach to economic analyses from both an employer's perspective and a societal perspective was also undertaken. **Results:** Eleven RCTs were identified, and review of these studies determined that the economic impact of the majority of CWPs analyzed was mostly negative. We discuss a possible explanation for these discrepancies with regard to prior reviews in this area. Despite the fact that the RCT is the "gold standard" for investigating without bias, several limitations to the methodology may have influenced the results of the studies in this review and suggested the use of caution in the interpretation of the results. **Conclusions:** The findings of this review could be a "wake up call" for companies regarding the high probability of bias from non-RCT studies, the majority of which report a positive economic impact of these programs, and the risk of taking inappropriate decisions based on the results of such studies.
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Key words: Cost-benefits analysis, Cost-effectiveness analysis, Cost-utility analysis, Health-care costs, Occupational health services, Randomized controlled trial

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There is long-term evidence showing that health status and productivity are closely related to idea that healthy people are associated with healthy businesses[1,2]. Adhering to this belief, corporate wellness programs (CWP) came about as a combination of educational, organizational, and environmental activities designed to motivate and promote healthy lifestyles among company employees and their families. One of the first workplace-based recreation and fitness programs evolved over a century ago in 1879. when the Pullman Company introduced such a program within its own athletics association. Sixty-two years later, in 1941, the National Employee Services and Recreation Association (NESRA) was founded, and from beginning, these programs were designed to slow rising costs caused by absenteeism and loss of productivity. In the late 1950s, the Pepsi Corporation established its physical fitness program, and in the 1960s and 1970s and throughout the 1980s, many other companies followed suit, a trend that has continued until today. In the 1990s, corporative fitness concepts evolved into corporative wellness concepts as an internal vector of corporate social responsibility to development of a new healthy workplace culture[3].

Those were times of blind acceptance of the effectiveness of health promotion, but within a few years, corporate leaders were asking for data to support the continuation of long-standing and, in certain cases, expensive CWPs. At this time some pioneering studies[4] focused on fitness attempted to determine if employees who participated in a fitness program could be less costly for industry when compared with employees who did not participate in a fitness program, or if employees who participated in a fitness program were absent less often due to health reasons and had reduced medical costs compared with employees who did not participate in a fitness program. In the 1990s, the results of review studies from randomized control trials (RCTs) and quasi-experimental designs suggested, despite limitations of the methodologies used, that the vast majority of the research indicated positive clinical and cost outcomes[5–8].

Currently, the most important reason companies give for providing CWPs are closely related to workforce productivity and health, because both have become critical factors in the strength and sustainability of a company's overall business performance. Absenteeism caused by injury or disease affects productivity; however, even when employees are physically present at their jobs, they may experience decreased productivity and below-normal work quality--a concept known as presenteeism[9].

Economic analyses from two perspectives were most commonly used with regard to CWPs in studies: these were CEA (cost-effectiveness analysis) and CUA (cost-utility analysis) from the societal perspective and CBA (cost-benefit analysis) from the employer perspective. A CEA is a measure of the cost of an intervention relative to its impact, usually expressed as a monetary value per unit of effect. While CEA is most useful for choosing the most efficient program from among various alternatives, CBA is most useful for evaluating a single program. The essential difference between CEA and CBA is that CEA is primarily focused on the cost of achieving a specific effect, while CBA primarily focuses on any and all benefits that can be generated for a program'cost. To put another way, cost-effectiveness is expressed as Euros per unit of effect (e.g., €10 for every new employee screened for a low back injury prevention program), while benefit-cost can be expressed as a ratio of total benefits achieved for every Euro spent on a program (e.g., €10 saved in emergency department visits not made and work time not lost for every Euro spent on a medical self-care program)[10].

In the last decade, critical review studies focused on CWPs showed further evidence of positive clinical and cost outcomes, but it has also been discovered that the quantity and quality of such research continues to decline. At a time when corporations and health plans are demanding more evidence-based outcomes, this decline in rigorous research marks a serious challenge to the field of health promotion and disease management[11]. There have been innovations in pilot studies, quasi-experimental methodologies, and econometric modeling, but there has been a prominent decrease in the number of RCTs conducted[12]. The main indicators of CWP economic impact that have been analyzed include the benefit effectiveness ratio (BER), benefit cost ratio (BCR), benefit utility ratio (BUR), and return of investment (ROI) related to care cost and absenteeism cost. Several recent reviews[1,13,14] reported on the impact of CWPs on positive returns with regard to employee health-care costs due to significant reductions in costs of absenteeism and health care. These reviews, however, focused on American programs in big companies, and the majority of studies analyzed were not randomized or controlled. In fact, in a few RCTs, the average financial returns estimates were negative. Other similar studies have highlighted the need for more and better methods when evaluating CWP outcomes[15] and the fact that none of them may reflect the true return on investment of these programs[16].

Oddly, in Europe, CWPs hardly ever been studied with RCTs, and little is known about that. Therefore, there is an arguable need to identify and report on literature concerning CWPs in Europe in order to determine the strength of the evidence available. The aim of this study was summarize the current evidence concerning the economic impact of CWPs in Europe based on RCT results.

Material and Methods

Inclusion criteria

Eligible for inclusion were studies evaluating the economic impact of CWPs that made comparisons with a care as usual (CAU) or nonintervention group and included analyses in which the results were converted into monetary values. No limitations were set as to the perspective of the economic analysis (e.g., employer's or society's perspective), program format (e.g., assessment, education/information, behavioral, exercise programme), worksite characteristics (e.g. age, gender, occupation, proportion of full-time employees and number of employees, public or private company) and follow-up duration. Studies targeting employees with chronic conditions, long-term sick-listed employees or unemployed workers also were accepted.

Search strategy

The search for evidence consisted of searching in electronic literature databases (PubMed, SPORTDiscus, and Business Source Premier) to identify relevant studies published from inception to 15 September 2013. Search terms included "workplace", "wellness", "corporate", "occupational", "health", "program", "economic", "impact" and "Europe". Additionally, we screened the reports of recent systematic reviews and evidence briefings on related topics known to us to identify additional primary studies to be considered for inclusion. After the first result, we applied the following search limits: a) RCTs, b) studies written in English and c) abstract available. After reading titles and abstracts, the full texts of studies that met the inclusion criteria were retrieved, read and checked for eligibility. The main reasons for exclusion were as follows: a) papers made presentations concerning the design of future studies without results, b) studies with analyses in which the results were not converted into monetary values, c) full text requested but not received in time for inclusion in the analysis

and d) duplicate publication contributing no additional relevant primary data. Data on study design (sample size, study population, length and follow-up), program focus and format, economic evaluation method and unit used for costs were extracted. One reviewer extracted data using a predesigned data extraction form. A second reviewer checked 100% of the extracted data. No disagreements were found between reviewers. A meta-analysis was not possible owing to the heterogeneity of the included studies, and therefore, data were synthesized narratively. In the studies analyzed, societal and employer perspectives appeared separately, but for easier understanding in this review, a summary is shown for both.

Data synthesis

We monetized the program costs from both perspectives (employer and society) to provide the most comprehensive economic evaluation. In the studies, there were two basic units of cost; direct costs (intervention and health care) and indirect costs (absenteeism and loss productivity). To provide a complete picture of the economic impact, four metrics were calculated for each intervention evaluated in the included studies: total cost intervention (TCI), total cost control (TCC), cost per participant (CPP) and net cost (NC). TCI was calculated as the sum of direct costs (intervention program and health-care costs) plus indirect costs (sick leave and productivity loss at work) for the intervention group. We summed total cost (direct plus indirect) for the intervention (IG) and control group (CG) to calculate TCI and TCC, respectively. CPP was calculated as the sum of the TCI and TCC divided by the total number of participants in the intervention and control respectively. NC was calculated as the difference between the CPPs of the intervention and control groups. We standardized the costs of programs to figures in Euros and calculated the NC as a comparable indicator of the economic impact of programs.

Results

The first outcome from the database search was 63 papers. After removing duplicates, titles and abstracts were screened for inclusion, and 21 full texts were retrieved. After reading all 21 full texts, 11 articles were identified that met the inclusion criteria and were included in the review (Table 1). A summary of descriptive characteristics of the studies is presented

Table 1. Summary of the studies analyzed (n=11)

Study	Author, year	Aim
1	Brouwers EP, 2006	To evaluate the CEA/CBA of an intervention designed to reduce sick leave duration in employees with minor mental disorders
2	Groeneveld IF, 2011	To investigate CEA/CBA of a lifestyle intervention for workers with an elevated risk of cardiovascular disease
3	Ijzelenberg H, 2006	To evaluate the CEA of a prevention program for LBP in an occupational setting with an economic evaluation
4	Karjalainen K , 2004	To investigate the CEA of an intervention and the incremental effect of a worksite visit for employees with subacute disabling LBP
5	Lambeek LC, 2010	To evaluate the CEA/CUA/CBA of an integrated care program for sick-listed workers with chronic LBP
6	McEachan RR, 2011	To explore the impact and CEA of a workplace physical activity intervention in employees apparently healthy
7	Proper, KI, 2004	To evaluated the impact of worksite physical activity counseling using CEA/CBA in employees apparently healthy
8	Robroek SJ, 2012	To evaluate the CEA of a long-term WPI on physical activity (PA) and nutrition in employees apparently healthy
9	Steenstra IA, 2006	To evaluate the CEA/CUA of a RTW program for workers on sick leave due to LBP
10	Van Oostrom SH, 2010	To evaluate the CEA/CUA/CBA of an RTW program for sick-listed employees with distress
11	Vermeulen SJ, 2013	To study the CEA/CUA/CBA of an RTW program adapted for workers and unemployed workers, sick listed due to musculoskeletal disorders

CEA, cost-effectiveness analyse; CBA, cost-benefit analyse; CUA, cost-utility analysis; PA, physical activity; CAU, care as usual; RTW, return to work; WPI, workplace intervention; LBP, low back pain.

in Table 2. All studies were RCTs; five of them (3–5, 9, 11) focused on musculoskeletal disorders, (subacute and chronic back low pain), four (2, 6–8) focused on multiple risk factors, (physical inactivity, poor nutrition, blood pressure, percentage body fat and obesity), and two (1, 10) focused on mental disorders (emotional distress and minor mental disorders). Seven studies (2–8) recruited paid employees or active self-employed individuals, and four studies (1, 9–11) recruited paid employees on sick leave or unemployed individuals. Regarding the selection method for the intervention and control groups in these studies, six studies (1, 3, 4, 6–8) used block or cluster randomization to ensure a close balance between groups sizes or to minimize the transfer of relevant knowledge between groups and to avoid potential bias due to contamination, respectively. In the other five (2, 5, 9–11) the workers were prestratified for work type (blue collar, white collar, physically demanding or mentally demanding), type of worker (temporary agency, unemployed worker), sick leave (full time, part time, duration in weeks or months), economic sector (industry, health care, office work), and company (university, medical center, steel company). In all studies, interventions consisted of a self-assessment (through questionnaires), educational/training (individual or group) and professional advice (physician, physiotherapy, psychiatrist, social worker and general practitioners). In seven studies (4–10), the interventions included behavioral components (interview, scales and questionnaires), in five (4, 6–8, 11) the interventions included specific exercise programs (exercising with weights, walking and flexibility and mobility exercises), and in four (3–5, 9) the interventions included environment components (suggestion of the purchase of specific equipment for work to improve ergonomic conditions). Nine studies (2–4, 6–11) were carried out in the workplace, four (1, 4, 5, 9) were carried out in primary care or hospitals, and two (4, 9) were carried out in both sites. The main measure of effect in nine studies (1–5, 7, 9–11) was loss of productivity (sick leave, absenteeism); in seven studies (1, 3, 4, 6–9), it was functional and health status (physical component, mental component, self-report physical activity and dietary habits, anthropometric characteristics, body mass index), and in six studies (3–5, 9–11) it was quality of life (quality adjusted life years [QALYs]; health-related quality of life, self-report of occurrence, intensity and complications of pain). All studies (1–11) took into account the following single-person unit costs: a) direct costs for the intervention (developing and delivering the intervention including training of staff, materials and facilities, cost of time investment for labor experts) and control (health care utilization included medical consumption, hospital stay, diagnostic tests, medical specialists visits) and b) indirect costs (absenteeism paid work, productivity losses at work, sick leave duration until full work resumption). All studies selected conducted an economic analysis from a societal perspective, seven conducted analyses from the employer's perspective and from both perspectives (1, 2, 4, 5, 7, 10, 11).

The characteristics of the included studies are presented in Table 3. Nine studies were carried out in the Netherlands (1–3, 5, 7–11), one was carried out in Finland (4), and another was carried out in the United Kingdom (6). All studies were conducted with workers of both genders (42.0 ± 12.24% of females) from 18–65 years (43.6 ± 1.84 years). The average sample size of participants was (409.5 ± 285.79) for the intervention (211.6 ± 151.17) and control group (201.3 ± 138.78), with the average rates of dropout being 16.9 ± 16.52% and 13.1 ± 14.00% for the for intervention and control groups, respectively. Eight studies (1–3, 6–11) reported lengths of interventions varying from 8 to 39 weeks (16.0 ± 8.38 weeks). All studies assessed the impact of their respective interventions through a follow-up performed after 12 to 24 months (15.2 ± 4.17 months).

Table 4 displays a summary of the economic impact of the included studies as net costs per participant expressed in Euros according to three groups regarding focus of intervention: a) musculoskeletal disorders, b) multiple risks factors and c) mental disorders. Seven studies reported higher costs for their intervention groups than their control groups, and four studies (1, 3–5) reported lower costs for their intervention groups than their control groups; however, the differences were not statistically significant ($p>0.05$). The average annual intervention program cost per participant ranged from €730.00 to €7.77 (€146.30 ± 122.00). The average annual control program cost per participant ranged from €0.00 to €476.00 (€131.58 ± 102.02). The average annual total program cost per participant ranged from €1.206 to €17.11 (€278.01 ± 222.94). Finally, the average annual net cost per participant ranged from €-93.90 to 254.00 (€14.8 ± 49.68).

Discussion

This review aimed to summarize the current evidence concerning the economic impact of CWPs in Europe from the results of RCTs, and the main findings were the following. From a societal perspective, a) four studies[17–20] reported no consistent effects of their respective interventions; b) two studies[21, 22] reported positive but no significant effects of their respective interventions; three studies[23–25] reported significant positive effects of their respective interventions (functional and health status and quality of

Table 2. Summary of the studies included (n=11)

Characteristic	Study number	Percentage
Focus of intervention		
Musculoskeletal disorders	3, 4, 5, 9, 11	45.4
Multiple risk factors	2, 6, 7, 8	36.4
Mental disorders	1, 10	18.2
Total sample size		
< 300	1, 4, 5, 7, 9, 10, 11	63.6
300–600	2, 3	18.2
601–1,300	6, 8	18.2
Study population		
PE/SE in active	2, 3, 4, 6, 7, 8	54.5
PE/UW on sick leave	1, 5, 9, 10, 11	45.5
Randomization		
Block, cluster	1, 3, 4, 6, 7, 8	54.5
Stratified	2, 5, 9, 10, 11	45.5
Program format		
Self-assessment	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	100
Education/training	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	100
Professional advice	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	100
Behavioral	4, 5, 6, 7, 8, 9, 10	63.6
Exercise	4, 6, 7, 8, 11	45.4
Environment	3, 4, 5, 9	36.4
Program setting		
Workplace	2, 3, 4, 6, 7, 8, 9, 10, 11	81.8
Primary care, hospital	1, 4, 5, 9	36.4
Both	4, 9	18.2
Main measures of effect		
Loss productivity	1, 2, 3, 4, 5, 7, 9, 10, 11	100
Functional and health status	1, 3, 4, 6, 7, 8, 9	63.6
Quality of life	3, 4, 5, 9, 10, 11	54.5
Unit cost used		
Direct costs	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	100
Indirect cost	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	100
Economic analyses		
Societal perspective (CEA-CUA)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	100
Employer's perspective (CBA)	1, 2, 4, 5, 7, 10, 11	63.6

PE, paid employee; SE, self-employee; UW, unemployed worker; CBA, cost-benefit analysis; CEA, cost-effectiveness analysis; CUA, cost-utility analysis.

life, respectively) or in small group and therefore not consistent, and c) only two studies[26, 27] reported positive significant and consistent effects of their respective interventions (loss productivity and functional and health status). From an employer's perspective, a) the interventions in seven studies[17–22, 27] were more costly than the costs incurred for the control (no intervention or care as usual), and therefore no additional benefits were found in terms of cost saving. b) In two studies[23, 25], the intervention costs were slightly higher or lower but not more significant than the costs incurred for the control, and only two studies[24, 26] reported substantial cost savings versus the control group.

A summary of the conclusions of the studies reviewed provides a complete picture of the economic impact of the interventions. In seven studies[17–22, 27], the authors concluded bluntly that their interventions could not be recommended for implementation in companies or that there is no financial reason

Table 3. Characteristics of the studies included (n=11)

Study	Details	Population	Intervention and control conditions	Limitations	Conclusion
Brouwers *et al*. (1)	Setting: NL, Timing: 2001–2003 Length (I): 10 weeks Follow-up: 18 months	194 patients on sick leave for minor mental disorders. Average 40 years old, 60% females. IG: 98 (dropped 0.3%) CG: 96 (dropped 6.2%)	(I): Activating social work treatment through five individual sessions structured on three stages: (a) cause of loss of control, (b) development of problem-solving strategies; and (c) implementation. (C): Usual care	Information was not gathered on sick leave in the months after patients had resumed work.	Intervention was not superior in reducing sick leave duration, improving clinical symptoms and decreasing medical consumption.
Groeneveld *et al*. (2)	Setting: NL Timing: 2007–2009 Length (I): 6 months Follow-up: 12 months	537 construction workers with an elevated CVD risk. No average age or gender distribution reported. IG: 293 (dropped 48.8%) CG: 280 (dropped 46.4%)	(I): Three to five face-to- face counselling sessions at an occupational health service and 4 telephone counselling sessions with an occupational physician or occupational nurse. (C): Usual care	No-completion was relatively large and partly selective.	Intervention was more effective but also more expensive than usual care.
IJzelenberg *et al*. (3)	Setting: NL Timing: not stated Length (I): 6 weeks Follow-up: 12 months	489 workers in physically demanding jobs. Average 41.3 years old, 3% females. IG: 258 (dropped 28.3%) CG: 231(dropped 24.2%)	(I): Integrated approach of 3 preventive measures combining individually tailored education and training and advice on ergonomic adjustment of the workplace. (C): Usual care	Presence of bias due to selective loss to follow-up.	Intervention did not reveal any benefits in terms of effects or costs savings.
Karjalainen *et al*. (4)	Setting: FI Timing: 1998–2002 Length (I): not stated Follow-up: 24 months	164 patients with subacute LBP. Average 43.4 years old, 58.6% females. IG_1=56 (dropped 5.3%) IG_2=51 (dropped 3.9%) GC= 57 (dropped 7.0%)	(I1): Based on current guidelines conducted by physicians and physiotherapist involving clinical examination, information, support and simple advice. (I2) : I_1 plus worksite visit. (C): Usual care	Small sample size and lack of data on presenteeism.	Interventions 1 and 2 reduced daily symptoms and work absenteeism and increased treatment satisfaction and adaptation to pain.
Lambeek *et al*. (5)	Setting: NL Timing: 2005–2009 Length (I): not stated Follow-up: 12 months	134 adults sick listed because of chronic LBP. Average 46.1 years old, 42.0% females. IG=66 (dropped 12%) GC=68 (dropped 18%)	(I): Based on participatory ergonomics and a protocol based on cognitive behavioral principles conducted by a integrated care team (C): Usual care	Small sample size. The cost of the integrated care may have been underestimated.	The costs of intervention were lower than for usual care and after 12 months were even more cost effective than one.
McEachan *et al*. (6)	Setting: UK Timing: 2005–2009 Length (I): 3 months Follow-up: 12 months	1.260 employees from 44 work sites based within 5 companies. Average 42.8 years old, 54.0% females. IG=662 (dropped 0.9%) GC=598 (dropped 1.4%)	(I): Easy to implement toolkit, delivered in-house by trained local facilitators. They targeted the theoretical constructs from the theory of planned behavior. (C): Usual care	The sample may have been subject to “selection” bias.	The intervention was found not to be cost-effective; however, the substantial variability around this estimate suggested that further research is warranted.

Table 3. Characteristics of the studies included (n=11) (continued)

Proper *et al*. (7)	Setting: NL Timing: 2000–2002 Length (I): 9 months Follow-up: 18 months	299 civil servants of municipal services performing office work. Average 43.7 years old, 33.3% females. IG: 131(dropped 28.3%) CG: 168 (dropped 4.8%)	(I): Comprehensive health promotion intervention: counselling programme (face-to-face sessions) with the support of health education materials (C): Health education materials	The health-care costs were not taken into account.	The study did not find statistically significant differences in costs and benefits between the two study groups.
Robroek *et al*. (8)	Setting: NL Timing: 2007–2010 Length (I): 12 months Follow-up: 24 months	924 employees from health care organizations, commercial services and an executive branch of government. Average 42.1 years old, 51.5% females. IG: 465 (dropped 53.0%) CG: 459 (dropped 45.0%)	(C): Physical health check with face-to-face advice and personal feedback on a website (I): Idem C with several additional website functionalities: action-oriented feedback, self-monitoring, possibility to ask questions and monthly e-mail messages.	Subjective productivity loss at work was measured, using a single item assessing work productivity during the previous regular workday.	No additional benefits were found in effects or cost savings. The intervention in its current form can therefore not be recommended for implementation.
Steenstra *et al*. (9)	Setting: NL Timing: 2000–2003 Length (I): 8 weeks Follow-up: 12 months	196 workers on sick leave services due to LBP from occupational health services. Average aged 42.6 years old, 57.1% females. IG: 96 (dropped 0.0%) CG: 100 (dropped 0.0%)	(I1) : Workplace + clinical intervention consisting of a graded activity program based on operant behavioral therapy principles (I2) : Only workplace intervention (C1) : Usual care + clinical intervention $(C)_2$: Usual care	Productivity loss in the form of presenteeism, was not measured in this study.	The wokplace intervention results in a safe and faster RTW than usual care at reasonable costs, but the clinical intervention was less effective on all secondary outcomes and had higher costs.
Van Oostrom *et al*. (10)	Setting: NL Timing: 2006–2008 Length (I): 8 weeks Follow-up: 12 months	145 employees with distress on sick leave from three large organizations (university, medical center and steel Company). Average aged 48.9 years old, 21.4% females. IG: 73 (dropped 0.0%) CG: 72 (dropped 2.7%)	(I): Stepwise communication process to identify and solve obstacles to RTW. This intervention was based on consensus between the sick-listed employee and their supervisor. Three meetings were planned to take place within 2 weeks. (C): Usual care	The cost of the intervention may have been underestimated. Small sample size.	Widespread implementation of the workplace intervention is not recommended because there was no economic benefit compared with usual care.
Vermeulen *et al*. (11)	Setting: NL Timing: 2007–2009 Length (I): 15 weeks Follow-up:12 months	163 workers sick listed due to musculoskeletal disorders. Average aged 44.8 years old, 39.1% females. IG: 79 (dropped 8.9%) CG: 84 (dropped 0.0%)	(I): Usual care + participatory RTW structured in 6 progressive steps. (C): Usual care	The use of retrospective questionnaires may have biased the data. Productivity loss in terms of presenteeism was not measured.	The intervention was more effective but also more costly than usual care. The program enhanced work resumption and generated a net socioeconomic benefit.

Program format(s): a, (self-) assessment; b, education/information; c, behavioral; d, exercise program; e, environment; f, incentives. IG, intervention group; CG, control group; I, intervention; C, control; RTW, return to work.

Table 4. Summary of the economic impacts of the included studies as net costs per participant (Euros)

Study	Sample (participants) Groups		Economic impact (€/person) CPP		Difference	
	I	C	I_a	C_b	$NC_{(a-b)}$	*p* value
GROUP A: Multiple risk factors						
(2)	293	280	730	476	254	>0.05
(6)	662	598	25.37	0.00	25.37	
(7)	131	167	17.90	0.00	17.90	
(8)	218	252	21.73	20.06	1.67	
GROUP B: Mental disorders						
(1)	98	96	146.50	150.85	−4.35	>0.05
(10)	73	72	145.05	137.5	7.55	
GROUP C: Musculoskeletal disorders						
(3)	258	231	7.77	9.34	−1.57	>0.05
(4)	107	57	42.24	136.14	−93.90	
(5)	66	68	233.81	318.50	−84.69	
(9)	96	100	111.37	105.37	6.00	
(11)	79	84	128.97	93.59	35.38	

Economic impact was calculated as the difference in costs between the intervention and control groups during follow-up. A negative sign in the net cost data means higher cost for the intervention than the control; I, intervention; C, control; CPP, costs per participant; NC, net costs.

for implementing their programs; two studies[23, 25], concluded that interventions could be recommended because they would have effects without increasing costs or at reasonable costs, and in only two studies[24, 26], the authors concluded that their interventions had a large potential to reduce societal costs and increase effectiveness of care for society and productivity for employers. The following comment of the author of one of the studies represents a good example of the economic reality in the business world: "*implementation of this programs depends on the employer's willingness to pay*". As a final summary, we can affirm that out of eleven RCTs, only two reported that the effects and economic profitability were guaranteed. One of them[26] showed an incremental cost-effectiveness ratio of €145/kg for weight loss per employee and a difference of €254 in net employer cost between the intervention and control groups. The other[24] showed an incremental cost-effectiveness ratio annual of €−3.51/day for sustainable return to work per employee and a net societal benefit annually of €6731.62. From a double economic perspective evaluation, only these two studies could be recommended.

Our findings are in discordance with prior meta-analyses that reported a massive and positive economic impact of CWPs analyzed in the last decade, with average gross returns on investment of €4.65, 5.81 or 3.1 for each €1.00 invested, respectively[1, 13, 14]. We discuss briefly a possible explanation for these discrepancies from two closely related perspectives. The first is the socioeconomic and culture perspective. Almost all the studies included in the prior meta-analyses were conducted in the United States (US), and in our review, all the studies were carried out in Europe. As we all know, working conditions in the US are completely different from those in Europe. In the US, the government allows companies much more freedom to manage their employees' working conditions. It is a capitalist system, and the lack of universal health insurance, leads each company to decide on the insurance requirements of their workers and how they will compensate them. Employer-paid health insurance premiums for employees have risen nearly 1,000% since 1960, and this statistic alone is enough to move many companies to action[28]. More and more employers are finding CWPs to be the best option for combating the huge cost of insurance premiums. Probably due to these specific circumstances, implementation and systematic evaluation of CWPs have a long road ahead of them in the US[6–9, 11, 12]. However, in Europe, despite the fact that a growing number of studies and programs are addressing the mounting challenges of health in the workplace, only a small number of initiatives are systematic, and few have been evaluated[29]. Another clear difference between US studies and European studies is the recruitment methods used. There are a great variety of strategies

that have been used in the US to enhance recruitment and retention in CWPs, including economic incentives for participation, and any of these undoubtedly result in selection bias[30]. In fact, some authors have examined the legal issues employers and health plans must consider as they develop programs to reward healthy behavior patterns and discourage more unhealthy ones[31]. However, in many European countries, external economic incentives are discussed as a policy instrument to promote occupational safety and health (OSH) in companies by the European Agency for Safety and Health at Work[32]. The second is a major methodological issue. It is something that has been tested and concerns research ethics. On average, non-randomized trials and randomized trials with inadequate concealment of allocation tend to result in larger estimates of effect than randomized trials with an adequately concealed allocation. However, it is not generally possible to predict the magnitude, or even the direction, of possible selection biases and consequent distortions of treatment effects[33]. This phenomenon has been reported already in CWP reviews[34], which revealed that average financial were positive in non-randomized trials and negative in RCTs. Specifically, selection bias had been identified for more than a decade as a research challenge when estimating the financial impact of CWPs[35], along with others such as skewed data and small sample size.[15] The results of RCTs are recognized as the gold standard for efficacy; nevertheless, all the studies in the present review had limitations related to methodology that may have influenced the results. First of all, there was selection bias[19, 21, 26, 27] in which the more active individuals showed a keen interest in being a part of this kind of study and bias due to selective loss throughout follow-up[18, 19, 26]. Second, sample sizes were small[17, 20, 22–25, 27], and it is well know that because the distribution of cost data is typically heavily skewed, large study populations are needed. Third, costs were underestimated[18, 20, 24, 27] with respect to the productivity loss caused by reduced productivity when an employee is at work, as the recently introduced concept of presenteeism[36] was not measured in any of the studies included. Fourth, use of retrospective questionnaires[17, 22, 24] may have biased the data, reducing their reliability. Lastly, since all the studies included except two[21, 23] were set in the same country, caution is needed when generalizing the results to another context, e.g., to other countries.

Finally there are a number of limitations to our study that should be known. Firstly, a small sample size was used in this review due to the search strategy, which focused on RCTs. Secondly, it was not possible to avoid possible publication bias, since papers with significant findings concerning the positive economic impact of CWPs are more likely to be published those suggesting negative outcomes. Thirdly, the large variability of metrics, approach and economic assessment makes it very difficult to summarize the main outcomes. Also, there are some limitations regarding the area of CWP evaluation that should be taken into account. Firstly, there is no accepted definition of a work or corporative wellness program. This makes comparisons of figures across studies difficult. Secondly, the setting of the studies, (workplace, primary care, hospital) in any particular case could act as a confounding variable that is difficult to control. For example, the impact of a possible change in behavior as a result of receiving a piece of health advice from a person in a white coat in a hospital is different from that when receiving the same piece of advice in the workplace from nonmedical personnel.

The results of the present review seem to indicate that the economic impact of CWPs conducted in RCTs in Europe is mostly negative, in terms of the effects of the intervention (societal perspective) and cost savings (employer's perspective). Consequently, investment in the implementation of CWPs in such cases does not appear to be justified. However, these results should be approached with caution, since more RCTs should be performed in Europe regarding CWPs with long-term follow-ups for better and more consistent evidence regarding the economic impact of said programs. The findings of this review provide new evidence indicating that the best way to control the weaknesses of future economic impact of said studies, such as a possible selection bias, would be to carry out randomized controlled trials as a guideline. Therefore, the findings of this review have practical implications for companies, insomuch that they are a "wake up call" regarding the high probability of bias from non-RCT studies, and the risk of taking inappropriate decisions based on the results of such studies.

References

1) Aldana SG. Financial impact of health promotion programs: a comprehensive review of the literature. Am J Health Promot 2001; 15: 296–320.
2) Pelletier KR, Lutz R. Healthy people--healthy business: a critical review of stress management programs in the workplace. Am J Health Promot 1988; 2: 5–12.
3) Chenoweth D. The case for worksite health promotion, In. D Chenoweth (ed.), Worksite health promotion, Champaig, IL, Human Kinetics, 1–10: 1998.
4) White P. Does employee fitness decrease employee absenteeism and medical cost? Health Mat 1987; 5: 10–15.
5) Blair SN. Noneconomic Benefits of Health

Promotion, In. R Kaman, (ed.), Worksite health promotion economics. Consensus and analysis, Champaign, ILL: Human Kinetics; 1995. p.2–4.
6) Pelletier KR. A review and analysis of the health and cost-effective outcome studies of comprehensive health promotion and disease prevention programs at the worksite: 1993–1995 update. Am J Health Promot 1996; 10: 380–8.
7) Pelletier KR. A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: 1995–1998 update (IV). Am J Health Promot 1999; 13: 333–45.
8) Pelletier KR. A review and analysis of the clinical- and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: 1998–2000 update. Am J Health Promot, 2001; 16: 107–16.
9) Koopman C, Pelletier KR, Murray JF, Sharda CE, Berger ML, Turpin RS, Hackleman P, Gibson P, Holmes DM, Bendel T. Stanford presenteeism scale: health status and employee productivity. J Occup Environ Med 2002; 44: 14–20.
10) Chenoweth D. Financial analysis, In. D Chenoweth (ed.), Evaluating worksite health promotion, Champaign, ILL, Human Kinetics; 2002. p.79–132.
11) Pelletier KR. A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: update VI 2000–2004, J Occup Environ Med 2005; 47: 1051–8.
12) Pelletier KR. A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: update VII 2004–2008. J Occup Environ Med 2009; 51: 822–37.
13) Chapman LS. Meta-evaluation of worksite health promotion economic return studies: 2005 update. Am J Health Promot 2005; 19: 1–11.
14) Baicker K, Cutler D, Song Z. Workplace wellness programs can generate savings. Prevention 2010; 29: 304–11.
15) Goetzel RZ, Ozminkowski RJ. The health and cost benefits of work site health-promotion programs. Annu Rev Publi Health 2008; 29: 303–23.
16) Chapman LS. Meta-evaluation of worksite health promotion economic return studies: 2012 update. Am J Health Promot 2012; 26: TAHP1–12.
17) Brouwers EP, De Bruijne MC, Terluin B, Tiemens BG, Verhaak PF. Cost-effectiveness of an activating intervention by social workers for patients with minor mental disorders on sick leave: a randomized controlled trial. Eur J Public Health 2007; 17: 214–20.
18) Ijzelenberg H, Meerding WJ, Burdorf A. Effectiveness of a back pain prevention program: a cluster randomized controlled trial in an occupational setting. Spine 2007; 32: 711–9.
19) Robroek SJ, Polinder S, Bredt FJ, Burdorf A. Cost-effectiveness of a long-term internet-delivered worksite health promotion programme on physical activity and nutrition: a cluster randomized controlled trial. Health Educ Res 2012; 27: 399–410.
20) van Oostrom SH, Heymans MW, de Vet HC, van Tulder MW, van Mechelen W, Anema JR. Economic evaluation of a workplace intervention for sick-listed employees with distress. Occup Env Med 2010; 67: 603–10.
21) McEachan RR, Lawton RJ, Jackson C, Conner M, Meads DM, West RM. Testing a workplace physical activity intervention: a cluster randomized controlled trial. Int J Behav Nut PA 2011; 8: 1–12.
22) Vermeulen SJ, Heymans MW, Anema JR, Schellart AJ, van Mechelen W, van der Beek AJ. Economic evaluation of a participatory return-to-work intervention for temporary agency and unemployed workers sick-listed due to musculoskeletal disorders. Scand J Work Env Hea 2013; 39: 46–56.
23) Karjalainen K, Malmivaara A, Pohjolainen T, et al. Mini-intervention for subacute low back pain: a randomized controlled trial. Spine 2003; 28: 533–40.
24) Lambeek LC, Bosmans JE, Van Royen BJ, Van Tulder MW, Van Mechelen W, Anema JR. Effect of integrated care for sick listed patients with chronic low back pain: economic evaluation alongside a randomised controlled trial. Brit Med J 2010; 341: c6414.
25) Steenstra IA, Anema JR, van Tulder MW, Bongers PM, de Vet HC, van Mechelen W. Economic evaluation of a multi-stage return to work program for workers on sick-leave due to low back pain. J Occup Rehabil 2006; 16: 557–78.
26) Groeneveld IF, van Wier MF, Proper KI, Bosmans JE, van Mechelen W, van der Beek AJ. Cost-effectiveness and cost-benefit of a lifestyle intervention for workers in the construction industry at risk for cardiovascular disease. J Occup Environ Med 2011; 53: 610–7.
27) Proper KI, de Bruyne MC, Hildebrandt VH, van der Beek AJ, Meerding WJ, van Mechelen W. Costs, benefits and effectiveness of worksite physical activity counseling from the employer's perspective. Scand J Work Env Hea 2004; 30: 36–46.
28) Blumenthal D. Employer-sponsored health insurance in the United States: origins and implications. New Engl J Med 2006; 355: 82–8.
29) Kirsten W. Health and productivity management in Europe. Int J Work Health Manag 2008; 1: 136–44.
30) Serxner S, Anderson DR, Gold D. Building program participation: strategies for recruitment and retention in worksite health promotion programs. Am J Health Promot 2004; 18: 1–6.
31) Mello MM, Rosenthal MB. Wellness programs and lifestyle discrimination: the legal limits. The New Engl J Med 2008; 359: 192–9.
32) Elsler D, Treutlein D, Rydlewska I. A review of case studies evaluating economic incentives to promote occupational safety and health. Scand J Work Env Hea 2010; 36: 289–98.

33) Kunz R, Vist G, Oxman AD. Randomisation to protect against selection bias in healthcare trials. Cochrane database of systematic reviews, 2007; 2: MR000012.
34) van Dongen JM, Proper KI, van Wier MF, et al. Systematic review on the financial return of worksite health promotion programmes aimed at improving nutrition and/or increasing physical activity. Obes Rev 2011; 12: 1031–49.
35) Ozminkowski RJ, Goetzel RZ. Getting closer to the truth: overcoming research challenges when estimating the financial impact of worksite health promotion programs. A J Health Promot 2001; 15: 289-95.
36) Schultz AB, Edington DW. Employee health and presenteeism: a systematic review. J Occup Rehabil 2007; 17: 547–79.