Job stress, absenteeism and coronary heart disease European cooperative study (the JACE study)

Design of a multicentre prospective study

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Background: The motives, objectives and design of a multicentre prospective study on job stress, absenteeism and coronary heart disease in Europe (the JACE study) is presented in this paper. Some specific gaps in the reviewed literature are explicitly tapped into by the JACE study. Its objectives are i) to compare the distributions of the Karasek job stress scales for the same broad categories of occupations in different European countries (in males and females), ii) to study the predictive power of the job stress scales and the job strain model for one year of sickness absence (in males and females) and iii) to study the predictive power of the job stress scales and the job strain model for a three year incidence of coronary heart disease (in males only). Methods: In answering these questions, relations are studied controlling for gender, age, level of education, company size, physical work risks and shift work, as well as traditional risk factors for CHD (i.e serum cholesterol, serum HDL cholesterol, smoking habits and blood pressure). The JACE study is a Biomed 1 concerted action. The JACE group consists of eight participating centres from six countries, i.e. from Belgium and Sweden (two centres), France, Italy, Spain, Sweden and The Netherlands (each one centre). The coordination of the group is in Brussels. The participating centres brought in over 15,000 European workers to test the hypotheses.

Key words: coronary heart disease, job stress, multicentre prospective study, sickness absence

The JACE study, a multicentre prospective study on Job Stress, Absenteeism and Coronary Heart Disease in Europe along with its motive and objectives and its design, is presented in this paper.

For several years now, job stress has been a controversial issue in a large variety of research areas, both applied and fundamental in nature. In epidemiology, occupational and behavioural medicine, and psychophysiology in particular, research has mainly been directed at establishing and understanding the assumed relationship between job stress and coronary heart disease (CHD), the main 'killer' disease in Western countries.[1,2] A lot of research, particularly in the field of organizational and health psychology as well as behavioural medicine, has, however, also been directed at less dramatic (health) outcomes such as mood and job satisfaction, at behavioural outcomes, such as sickness absenteeism and medical consumption and disability for work, particularly as related to mental ill-health and musculoskeletal problems.[3–7]

One of the leading theoretical models in the job stress literature is the 'Demand–Control' model (DC model), which was popular in all the research areas mentioned above. It was developed by Karasek[1,8] and was originally directed at two major risk dimensions for job stress: (quantitative) psychological job demands and job control. The latter was operationalised as a combination of decision authority and skill discretion. The DC model states that it is the combination of high job demands and low job control that particularly leads to negative health outcomes. Later, 'social support' was added to the model as a third dimension.[1,9] The popularity of the model in this broad field of research is probably due to the fact that it is basically simple, has high face validity, has been found to be supported by a number of studies in the fields of

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epidemiology, psychophysiology, and organizational and health psychology, is not only directed at negative outcomes and ill-health but to productivity issues as well and provides elegant starting points for structural stress management by way of job redesign.

JOB STRESS AND CHD

Most validity studies within the framework of the DC model have been directed at CardioVascular Disease (CVD) and, more specifically, CHD. In 1994 Schnall et al.[2] published an extensive review on the available evidence. From the ten prospective studies on CHD, four were case-control studies, six had a prospective cohort study design and two studied the relation between job stress and all-cause mortality in a prospective cohort study design as well. Seven of the eight prospective cohort studies were found predictive for CHD or all cause mortality. The study by Siegrist et al.[10], which was not included in the Schnall et al.[2] review and which used a somewhat different job stress model, supports the predictive value of job stress for CHD. Of six recent prospective studies on the job stress–CHD relationship which were not included in the review,[11–17] five reported positive results,[12–16] of which four[12,14–16] only found limited support. In particular, the recent studies by Lynch et al.,[14] Marmot et al,,[15] and Steenland et al.[16] found control to be the only psychosocial work characteristic to be significantly related to CHD. For job demands, however, Steenland et al.[16] found a significant inverse trend in CHD risk for blue-collar workers and a combination of high control and high demands was found protective among these same workers. In a study by Hlatky et al.[17] the severity of CHD in patients showed no relation to job strain. This study, then, was not a representative population study group.

It is noteworthy that most of the studies on the DC model referred to above were mainly performed in either Sweden or the US, whereas the 'negative' studies were from Denmark and the US. The one from the US was performed on subjects living in Hawaii and of Japanese origin. The most recent studies, mainly from Europe, provide only partial support. It may be that certain national or cultural groups are more prone to be differentiated in their CHD risk by psychosocial work-related risk factors.[6] On the other hand, homogeneity in risk factors for job strain has been put forward as an explanation for the absence of a convincing relation between job strain and CHD.[11] A problem almost opposite that of homogeneity is that several of the studies made use of the imputation method.[16,18,19] This method links 'risk weights' of occupations found in another study to occupations in databases where no risks but only health outcomes are measured. The use of this method allows only between – and not within – occupational group analyses. One of the consequences is that this method prohibits a proper disentanglement of socioeconomic status (SES) and job stress risk. Moreover, not all prospective studies controlled for all the 'traditional' coronary risk factors: smoking, serum cholesterol and blood pressure levels. The recent prospective studies on psychosocial risks and CHD mortality by Lynch et al.[14] and Marmot et al.[15] pointed to the necessity of measuring at least all traditional risk factors for CHD mortality or incidence as well as being able to disentangle SES from occupational risks. The lack of coherence in the results of the prospective studies illustrates the need to study the relationship between job stress and CHD further, particularly in a prospective multinational, multicultural setting, and controlling for all traditional risk factors. Analysing the results across and within occupational group differences is highly warranted.

JOB STRESS AND ABSENTEEISM

Beyond the health consequences of work, the DC model also captures the perspectives of the work's organizers who are concerned with productivity results. The most often cited outcome for productivity in these studies is absenteeism. One of the main reasons for employers to take preventive measures in the workplace is to reduce absenteeism and promote productivity.[20] The DC model has not, however, received a prominent place in the study of sickness absence in general. Apart from studies we were already acquainted with, a literature search led us to 21 published articles that more or less explicitly tapped into the relationship between job stress and sickness absence. This literature shows that health problems and personal characteristics may be very important in explaining the variance in sickness absence, but the role of job stress is still not very clear. Some studies indicated that job stress and other job characteristics play no role in sickness absence[20] or play an indirect role in explaining the prior 3–6 months of sickness absence (e.g. via job satisfaction, affective responses or health complaints).[21–26] Other studies indicated a clear and main effect of one or more job stress risks on absenteeism,[8,27–34] whereas again others found weak or partial relationships.[35–37]

The studies presented above are relatively difficult to compare since they often differed in the operationalization of both job stress and absenteeism and in the size and type of population under study. In some studies sickness absence was measured by way of self-report, whereas in others absence registrations were used. A single study did both and found a high level of correspondence (84%).[34] In the literature on sickness absence the correspondence between self-reported and registered absenteeism is corroborated, but a systematic underreporting of absence in case of self-report is often found.[38,39]

Apart from the differences in methodology used and population studied, some general notions can be deduced from the studies referred to above. Sickness absence was almost always measured prior to completion of the questionnaires measuring the risk of job stress. The analyses of Manning and Osland[40] indicated that job stress risks may be even more correlated with retrospective or 'present' absenteeism than with consecutive absenteeism, suggesting the hypothesis that absenteeism resulting from job stress may be less likely than the reversed relationship. In addition several non-work factors, such as family res-

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ponsibilities and life style factors (e.g. alcohol consumption), have been found to be significantly related to absenteeism.[21,23]

A recent longitudinal study by North et al.[33] showed that job stress leads to short absence spells (≤7 days). Correcting for 'occupational grade' of the subjects in that study (civil servants) resulted in the relation between job strain and long spells (>7 days) becoming insignificant. Finally, absenteeism itself and short spells in particular have been discussed as a type of coping behaviour used in situations where a longer recovery period is felt needed.[30]

This literature leads us to the conclusion that the relation between job stress and sickness absence is considered to be important, particularly from an organizational and productivity point of view, but that the results presented are even less coherent than those for job stress and CHD. This may be due to differences in the way job stress and particularly absenteeism were measured, the population studied, the point in time of absence measurement as related to either prior or consecutive job stress measurement and other moderators or mediators measured. The JACE study is one of the first prospective studies that looks into the relations between reported health problems, sickness absence and CHD simultaneously in a multinational, multi-occupational cohort, taking into account known moderators such as personal characteristics such as educational level, family responsibilities and life style factors.

Objectives of the JACE study are as follows.

- To compare the distributions of the Karasek job stress scales for the same broad categories of occupations in different European countries (in males and females).
- To study the predictive power of the job stress scales and the job strain model on 1 year of sickness absence (in males and females).
- To study the predictive power of the job stress scales and the job strain model on a 3 year incidence of CHD (in males only).

In answering these questions, relations are studied, controlling for gender, age, level of education, company size, physical work risks and shift work, as well as traditional risk factors for CHD (i.e serum cholesterol, serum HDL cholesterol, smoking habits and blood pressure).

MATERIAL AND METHODS

Organization of the study

The JACE study is a Biomed 1 concerted action. The JACE group consists of eight participating centres from six countries, i.e from Belgium and Sweden (both two centres), France, Italy, Spain and The Netherlands (one centre each). The coordination of the group is in Brussels.

Choice of populations for the study and sample sizes

Study populations were chosen from an organizational perspective. Apart from the Spanish, Malmö and Gothenburg centres who used a population sample, all centres recruited a more or less diverse employee population from one or more organizations that agreed to participate. Men and women aged 35–59 years, were screened for the core study. The screening periods and some population characteristics are shown in *table 1*.

Study design

This concerted action applied a prospective study design with an average follow-up of at least three years for incidence of myocardial infarction and a one year average

Table 1 Screening periods and (estimated) sample sizes of the participating centres

Centre	Start of screening	End of screening	Estimated sample size at the end of screening	Occupational groups
Belgium, Ghent (Flemish)[a]	17 November 1994	31 January 1998	n=15,000[a] women = 2,500, men = 12,500	Occupational groups from several organizations
Belgium, Brussels (French)[a]	9 February 1995	31 January 1998	n=15,000[a] women = 2,500, men = 12,500	Occupational groups from several organizations
France, Lille	15 January 1996	1 November 1997	n=7,500[a] women = 2,500, men = 5,000	Occupational groups from several organizations
Italy, Milano	22 May 1991	31 March 1997	n=4,850 women = 3,112, men = 1,738	Occupational groups from the municipality of Milano
Spain, Barcelona	20 June 1994	20 May 1996	n=1,438 women = 505, men = 933	Population survey
Sweden, Gothenburg	i) 1 February 1993 ii) 15 September 1994	15 June 1994 15 December 1995	n=2,226 i) men = 798 (men born in 1943) ii) men = 556, women = 872	Population surveys
Sweden, Malmö	17 february 1992	28 February 1994	n=6,528 (2,684 with biology) women = 3,747 (1,549 with biology) men = 2,781 (1,135 with biology)	Population survey (city of Malmö)
The Netherlands, Leiden/Amsterdam	1 March 1994	15 March 1995	n=884 women = 202, men = 682	Occupational groups from several organizations
Total			n=53,426 women = 15.938, men = 37,488	

a: Baseline screening not yet finished

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follow-up for incidence of sick leave of 15 days or more. The core programme was similar in all centres and additional measurements related to local interests were included as well.

- The questionnaire

The following information was collected in the core questionnaire:

i) Sociodemographic variables,[41,42] job title[43] and branche of industry (NACE–EU classification).

ii) Perceived risk of job stress: the Job Content Questionnaire (JCQ)[44] and other working conditions.[44,45]

iii) Smoking habits and alcohol consumption.[41,42]

iv) Presence of disease (cardiovascular disease,[46] diabetes and hypertension,[41,42] and other chronic diseases[42]

v) General health complaints[47,48] and psychological responses.[49–51]

- Clinical and biological measures

A single standardized screening visit was organized for each participant in order to obtain data on i) height and weight, ii) arterial blood pressure and heart rate and iii) serum total cholesterol and HDL cholesterol. The body mass index (BMI) was calculated from height and weight.[41,42,52]

All centres, with the exception of the Dutch group, which did not participate in the cardiovascular part of the study, participated in an external quality control system, in order to measure validity and precision of biochemical measures.

- Follow-up

Sickness absence: The absence data were monitored in calendar days. For reasons of standardisation, all participating centres were comparable using time periods of a duration of more than 14 days. Absence was registered for a follow-up of one year, starting from the moment the subject entered the study. The absence indices are illustrated in the 'Manual of Operations'.[52]

Coronary events: The primary outcome was fatal and non-fatal myocardial infarction. Four types of coronary events were discerned: i) definite acute myocardial infarction, ii) possible acute myocardial infarction or coronary death, iii) ischaemic cardiac arrest with successful resuscitation not fulfilling criteria for definite or possible myocardial infarction and iv) fatal cases, whether sudden or not, with insufficient data. Diagnostic criteria for the four categories are described in the 'Manual of Operations',[52] as well as in the MONICA project,[41,42] which we often referred to in this study for standardization.

- Statistics: power calculations

Power calculations:

Sickness absence: The power calculations for sickness absence of more than 14 days were based on the assumption of a 1 year incidence of 10% in both males and females, aged 35–59 years. Under this assumption the study had a power of 90% for detecting relative risks between quartile 4 and quartile 1 for given job stress scales of respectively 1.12 and 1.18 in our samples of males and females.

Incidence of CHD in males: Incidence of the first major coronary event was based on the Belgian Heart Disease Prevention Project[53] and the MONICA study.[41,42] Taking into account the 'healthy worker effect', the current Acute Myocardial Infarction Incidence (AMI) was assumed to be three per 1000 subjects yearly or nine per 1000 subjects over 3 years. Under the assumption that the risks of AMI in four quartile groups of a given job stress scale are linearly related and that the risk of AMI in the highest quartile (Q4) relative to the lowest quartile (Q1) is given as Relative Risk (RR), the expected Incidence Rate (IR) for the total number of male subjects aged 35–54 years needed to detect a relative risk (IR_{Q1} / IR_{Q4}) of 1.6 with a power of 80% was estimated to be 32,416.

DISCUSSION

The core research questions of this prospective multinational, multicultural study aim to investigate the relationship between self-perceived job stress and two dependent measures: sickness absence of more than 14 days and the incidence of myocardial infarction. In the introduction the benefits of the present study, both with respect to standardisation of independent and dependent variables, as well as the inclusion of those to be considered important moderating and mediating variables and the multinational and multicultural character of the study were explicitly touched upon. An extra benefit of the study is the possibility of studying the interrelation between outcomes that, on the one hand, are considered highly important from an organizational and managerial point of view – different operationalizations of registered sickness absence – and important outcomes from a public health point of view – CHD morbidity and mortality – in a prospective way.

The importance of the first research question, i.e. the comparison of self-reported risks of job stress for the same broad occupational categories in different (European) countries, may be somewhat hidden. It has been tackled indirectly in the introduction though, when considering the methodological problem of variance in exposure and perceived exposure of risks to be studied within and between – more or less homogeneous – (e.g. for job stress) in the study of exposure or perceived exposure and its relationship to various dependent measures. A pre-assumption of this study is that different occupations in different countries have comparable scores on the JCQ scales or at least have relatively stable positions on the JCQ scales. This assumption has, however, to be looked at in greater detail. There is reason to believe that this latter assumption may not be completely correct. Particularly in the case when technological standards of an occupation or branch are very different across regions or countries, it is usual to expect differences in exposure or perceived exposure to risks, e.g. job stress risks. Although variation within an occupation may be objectively correct, it may differ per risk factor or group: for example, Karasek and Theorell[1] indicated that the scales constituting decision latitude were found to discriminate relatively well between occupations, whereas job demands and social support were found to discriminate poorly between them. Analyses of the data from the surveys conducted by the European Foundation,[45,54] however, also indicate

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that the experience of job demands in the same branch may differ greatly for different countries.

In summary, there may be both objective and subjective variance in risk factors by occupation and by country. Because of its high level of standardisation, the JACE study, incorporating organizational samples from northern, southern and middle Europe, and variation across and within occupations, will provide ample opportunity to look into the correspondence of different occupational stress scores for the JCQ scales, compare their variances and compare the results when linking these risk scores to a variety of dependent measures. The presence of a north-south gradient in the JACE study makes the first research question not only a methodological one, in the sense as just described, but also it can be seen as a test of the international validity of the JCQ as an international screening instrument for psychosocial risks at work. The fact that 'work' in southern countries is often organized in a more traditional way as compared to northern countries and the attitude to work is assumed to be different, i.e. work is assumed to be seen as less prevailing than in the northern countries, gives the analyses performed to test the first hypothesis an additional dimension.

This is a Biomed 1 concerted action (BMH1–CT94–1336).

REFERENCES

1 Karasek RA, Theorell T. Healthy work. New York, NY: Basic Books, 1990.

2 Schnall PL, Landsbergis PA, Baker D. Job strain and Cardiovascular Disease. Annu Rev Public Hlth 1994;15:381-411.

3 Ross DS. Mental health at work. Occupat Hlth Safety 1989;19(3):12.

4 Bongers PM, de Winter CR, Kompier MAJ, Hildebrandt VH. Psychosocial factors at work and musculoskeletal disease. Scand J Work Environ Hlth 1993;19:297-312.

5 Houtman ILD, Bongers PM, Smulders PGW, Kompier MAJ. Psychosocial stressors at work and musculoskeletal problems. Scand J Hlth Environ Health 1994;20:139-45.

6 Marmot M. Work and other factors influencing coronary health and sicknes absence. Work Stress 1994;8(2):191-201.

7 Manning MR, Jackson CN, Fusilier MR. Occupational stress and health care use. J Occupat Hlth Psychol 1996;1(1):100-9.

8 Karasek RA. Job demands, job decisions latitude, and mental strain: implications for job-redesign. Adm Sci Q 1979;24:285-308.

9 Johnson JV, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. Am J Public Health 1988;78:1336-42.

10 Siegrist J, Peter R, Junge A, Cremer P, Seidel D. Low status control, high effort at work and ischemic heart disease: prospective evidence from blue-collar men. Soc Sci Med 1990;31(10):1127-34.

11 Netterstrom B, Suadicani P. Self-assessed job satisfaction and Ischaemic Heart Disease Mortality: a 10-year follow-up of urban bus drivers. Int J Epidemiol 1993,22(1):51-6.

12 Alterman T, Shekelle RB, Vernon SW, Burau KD. Decision latitude, psychologic demand, job strain, and coronary heart disease in the Western Electric Study. Am J Epidemiol 1994;139(6):620-7.

13 Johnson JV, Stewart W, Hall EM, Fredlund P, Theorell T. Long-term psychosocial work environment and cardiovascular mortality among Swedish men. Am J Public Hlth 1996;86(3):324-31.

14 Lynch J, Krause N, Kaplan GA, Tuomilehto J, Salonen JT. Workplace Conditions, Socioeconomic Status, and Risk of Mortality and Acute Myocardial Infarction: The Kuopio Ischemic Heart Disease Risk Factor Study. Am J Public Hlth 1997;87(4):617-22.

15 Marmot MG, Bosma H, Hemingway H, Brunner E, Stansfeld S. Contribution of job control and other risk factors to social variations in coronary heart disease incidence. Lancet 1997;350:235-39.

16 Steenland K, Johnson J, Nowlin S. A follow-up study and heart disease among males in the NHANES1 population. Am J Indust Med 1997;31:256-60.

17 Hlatky MA, Lam LC, Lee KL, et al. Job strain and the prevalence and outcome of coronary artery disease. Circulation 1995;92:327-33.

18 Karasek RA, Baker D, Marxer F, Ahlbom A, Theorell T. Job decision latitude, job demands, and cardiovascular disease: a prospective study of Swedish men. Am J Public Hlth 1981;71:694-705.

19 Karasek RA, Theorell T, Schwartz JE, Schnall PL, Pieper CF, Michela JL. Job characteristics in relation to the prevalence of myocardial infarction in the US Health Examination Survey (HES) and the Health and Nutrition Survey (HANES). Am J Public Hlth 1988;78:910-8.

20 Houtman I, Goudswaard A, Dhondt S, Van der Grinten MP, Hildebrandt VH, Van der Poel EGT. Dutch monitor on stress and physical load: risk factors, consequences and preventive action. Occupat Environ Med 1998;55:73-83.

21 Vahteri J, Pentii J, Uutela A. The effect of objective demands on registered sickness absence spells: do personal, social and job-related resources act as moderators? Work Stress 1996;10:286-308.

22 Skyrme PYT. The relationship of job stressors to work performance, intent to quit, and absenteeism of first line supervisors. Diss Abstracts Int 1992;53(4):2093-B.

23 Brooke PP, Price JL. The determinants of employee absenteeism: an empirical test of a causal model. J Occupat Psychol 1989;62:1-19.

24 Cooper CL, Bramwell RS. A comparative analysis of occupational stress in managerial and shopfloor workers in the brewing industry: mental health, job satisfaction, and sickness. Work Stress 1992;6(2):127-38.

25 Hendrix WH, Steel RP, Leap TL, Summers TP. Development of a stress-related health promotion model: antecedents and organizational effectiveness outcomes. J Soc Behav Person 1991;6(7):141-62.

26 Kohler SS, Mathieu JE. Individual characteristics, work perceptions, and affective reactions on differentiated absence criteria. J Organizat Behav 1993;14:515-30.

27 Parkes KR. Occupational stress among student nurses: a natural experiment. J Appl Psychol 1982;67:784-96.

28 Spector PE. Perceived control by employees: a meta-analysis of studies concerning autonomy and participation at work. Human Relations 1986;39:1005-6.

29 Turner WED, Facom DIH. Sickness absence in the freezing industry. NZ Med J 1988;101:663-6.

30 Kristensen T. Sickness absence and work strain among Danish slaughterhouse workers: an analysis of absence from work regarded as coping behaviour. Soc Sci Med 1991;32(1):15-27.

31 Parkes KR. Locus of control as moderator: an explanation for additive versus interactive findings in the demand-discretion model of work stress? Br J Psychol 1991;82:291-312.

32 Sheffield D, Dobbie D, Carroll D. Stress, social support, and psychosocial and physical wellbeing in secondary school teachers. Work Stress 1994;8(3):235-43.

33 North FM, Syme SL, Feeney A, Shipley M, Marmot M. Psychosocial work environment and sickness absence: the Whitehall II Study. Am J Public Hlth 1996;86:332-40.

34 Undén A-L. Social support at work and its relationship to absenteeism. Work Stress 1996;10(1):46-61.

35 Breaugh JA. The measurement of work autonomy. Human Relations 1985;38:551-70.

36 Härenstam A, Palm U-B, Theorell T. Stress, health and the working environment of Swedish prison staff. Work Stress 1988;2(4):281-90.

37 Dwyer DJ, Ganster DC. The effects of job demands and control on employee attendance and satisfaction. J Organizat Behav 1991;12:595-608.

38 Harrison DA, Shaffer MA. Comparative examinations of self-reports and perceived absenteeism norms: wading through

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lake Wobegon. J Appl Psychol 1994;79(2):240-51.
39 Rees D. Research note: reliability of self-report sickness absence data in the health service. Hlth Serv Manage Res 1993;6(2):140-1.
40 Manning MR, Osland JS. The relationship between absenteeism and stress. Work Stress 1989;3(3):223-35.
41 WHO MONICA project. Monica Manual. Geneva: WHO, 1990.
42 WHO MONICA Project. Myocardial Infarction and Coronary Deaths in the World Health Organization MONICA Project: Registration procedures, event rates, and case-fatality rates in 38 populations from 21 countries in four continents. Circulation 1994;90:583-612.
43 ILO. ISCO-88: International Standard Classification of Occupations. Geneva: ILO, 1990.
44 Karasek RA, Pieper CFG, Schwartz JE. Job Content Questionnaire and User's guide. Revision 1.1. Los Angelos: USCLA, 1985.
45 Paoli P. First European survey on the work environment 1991-1992. European Foundation for the Improvement of Living and Working Conditions. Dublin: Loughlinstown House, 1992.
46 Rose GA, Blackburn H, Gillum RF, Prineas RJ. Cardiovascular Survey Methods. Geneva: WHO, 1982.
47 Joosten J, Drop MJ. De betrouwbaarheid en vergelijkbaarheid van drie versies van de VOEG (Reliability and comparability of three versions of the VOEG). Gezondheid en Samenleving 1987;8(4):251-65.
48 Rosengren A, Tibblin G, Wilhelmsen L. Self-perceived psychological stress and incidence of coronary artery disease in middle-aged men. Am J Cardiol 1991;68:1171-5.
49 Kohout FJ, Berkman JL-F, Evans D-A, Cornoni-Huntley J. Two shorter forms of the CES-D Depresion Symptoms Index. J Aging Hlth 1993;5(2):179-93.
50 Ilifeld FW. Further validation of a Psychiatric Symptom Index in a Normal Population. Psychological Report 1976;39:1215-28.
51 Appels A, Otten F. Exhaustion as precursor of cardiac death. Br J Clin Psychol 1992;31:351-6.
52 JACE. I: Manual of Operations. Brussels: Department of Public Health, May 1996.
53 Kornitzer M, Backer G de, Dramaix M, Kittel F, Thilly C, Graffar M. Belgian heart disease prevention project: incidence and mortality results. Lancet 1983;I:1066-70.
54 Paoli P. Second European survey on the work environment 1995-1996. European Foundation for the Improvement of Living and Working Conditions. Dublin: Loughlinstown House 1997.

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