

The Job Content Questionnaire: methodological considerations and challenges for future research

by

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Abstract

In studies of occupational stress and health, two leading theoretical models have over the years inspired and engendered a lot of scientific research. The job demand-control-support model (DCS) states that the most noxious combination as regards health outcomes is high job demands, low decision latitude and low social support at work. The effort-reward imbalance model (ERI) emphasises that stress occurs when rewards in terms of money, esteem and career opportunities no longer match efforts. To accommodate for such factors at the organisational or larger economy level, the Job Content Questionnaire (JCQ) connected with the DCS-model was supplemented with a few items that survey perceptions of job insecurity and of impact of world market

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competition (WMC) on one's job. In the large Belstress-I sample with observations in 21,419 employees of 25 large companies across Belgium during 1994-1998, all JCQ-scales were found to reach acceptable internal consistency reliability. Also a remarkable clear factor structure in line with predictions was produced. Perception of a high level of job insecurity and perception of impact of WMC are positively and independently related with self-reported poor health or a depressive mood. Associations are, however, rather weak in both gender groups. On the other hand, precisely these added new constructs show a significant rise over time in mean scores, to judge from repeat observations in 594 participants to Belstress-II in 2001. The need to further monitor health effects of changes at the organisational and global economy level is debated.

Introduction

For more than a quarter of a century now, the job demand-control model (DC) or the job strain model proposed by Robert Karasek in the late 1970s (1) has inspired and engendered a lot of scientific research in the field of work-related stress and health (2, 3). In the area of stress at work and coronary heart disease for instance, studies using the job strain model or its extension into the job demand-control-support model (DCS) (4, 5), represent by far the largest group using a common conceptual model (6, 7). The great advantage of the DC(S) model is indeed that it offers both a conceptual framework and a standardized measurement tool for the rather vague concept of work stress (2). This in the first place makes this hazy concept tangible and therefore comprehensible, not only for purposes of scientific research but also within job (re)design projects.

The paradigmatic function of the DCS-model however is also explained by a number of typical features of the model. First, the DC-model combines important results from two research traditions in the 1960s and 70s, one being an extensive research programme of the University of Michigan focusing on the relationship between pressure of work and ill health (8-10), the other being the so-called job redesign tradition with its typical attention for the impact of job control or "autonomy" on job satisfaction and performance (11-13). Particularly the combination of these traditions proved successful in the explanation of the rather favourable health profile of top-level employees experiencing a high pressure of work and much decision autonomy. Secondly, the model's attractiveness is also due to the general nature of its main dimensions – perceptions of job demands, job control and workplace social support –, which makes them duly applicable in a wide range of occu-

pational settings. Thirdly, some authors have pleaded that particularly the model's simplicity has served as a hallmark (14), both with reference to its basic concepts and to its scale items as formulated in the standardized Job Content Questionnaire (JCQ) (15).

Basically, the job strain model has as its central tenet that strain occurs in a situation of excessive psychological job demands as related to the level of job control. As such, the model emphasises that high psychological demands are not, in themselves, a great source of strain, since a worker who can decide and arrange for him/herself will be able to adequately meet the demands. By contrast, workers exposed to high job strain will in due time show the highest occurrence of symptoms of ill health or of psychological distress. "Psychological demands" refer to the quantity of work, the mental requirements, and the time constraints put on the worker; "job control" or "decision latitude" on the other hand refers to the ability of making decisions about one's own work and the possibility of being creative and using or developing skills (1). In the extended version, labelled as the DCS-model, it is hypothesized that the most noxious combination as regards health outcomes is high job demands, low decision latitude and low social support at work, the latter either from supervisors or from co-workers (5).

Over the last decade however, the professional arena has undergone remarkable and profound changes affecting both the nature and the context of work. In this respect, one may point to a number of largely interconnected developments such as the rapid expansion of the service sector, the changing structure of the workforce (more women, less younger, more higher educated), the globalisation of the economy (world scale of operations, increased competition), the flexibility of work (end of lifetime employment, more job insecurity, expansion of the 24-hour economy), the increasing use of information technology (internet, telematics), new production schemes (lean production, telework, flat organizations), new legislation on working conditions and absenteeism and finally changes in industrial relations (14). According to the Third European Survey on Working Conditions in Europe in the year 2000, a key feature is the increasing number of employees in the European Union employed in non-permanent contract work (16). This trend is believed to have significant consequences for the employees involved because studies have shown that people employed in so-called "precarious" jobs (non-permanent employment contracts or part-time work) are exposed to worse working conditions (17, 18).

An alternative job stress model that claims to reflect all these new features of modern times, is the "effort-reward imbalance" (ERI) model.

The model was developed by Johannes Siegrist and Richard Peter in the late 1980s and emphasises that stress occurs when rewards in terms of salaries, esteem and career opportunities (including job security) no longer match efforts made by the worker, whether linked to the workload (extrinsic source) or to overcommitment (intrinsic source) (19, 20). Lack of reciprocity and fairness between “costs” and “gains” (i.e. high efforts/low rewards) defines a state of emotional distress that is likely to provoke strain reactions. ERI applies to a wide variety of occupational settings, but most markedly to groups that are faced with rapid socio-economic change in the global economy. Compared to the DC(S)-model, two distinctive features come to the foreground: first, ERI focuses on “social equity” in working life, whereas DC(S) has a particular interest in “personal control”, and secondly, ERI uses a long-term perspective (lifecycle evaluation) linked to more distant macro-economic conditions whereas DC(S) rather applies a short-term perspective (day-to-day demands and control at work) linked to situational aspects of the psychosocial work environment (20).

Partly in reaction to the issues raised by ERI, Karasek supplemented the JCQ with a few items assessing 1) the respondent’s perception of job security and 2) the impact of world market competition on perceptions of job security, job demands and job control (15). His concern indeed was that the JCQ might get compromised by the rapidly increasing importance of factors at the organisational and, especially, global economy level that contribute to “increased demands and reduced control” (personal communication, March 1994). Little research however seems to have examined the confounding effect of the psychosocial job characteristics connected with the DC(S)-model on the association between these new factors and health status (21).

In this paper, it is our aim to focus attention on the following three objectives: first, to examine the scale reliability and validity of the JCQ-scales in the initial “Belstress cohort”. Scale reliability points to the precision of measurement or the degree to which the full-scale score is free from measurement error. Scale validity refers to the independent theoretical dimensions or constructs that are measured by the set of scale items (22). Secondly, to explore the independent associations between perceptions of either job insecurity or impact of world market competition and self-reported health outcomes, i.e. level of general health and level of depressive mood. Thirdly, to assess the changing nature of the psychological work environment with a special interest for factors related with the global economy through a comparison of scores on JCQ-scales in participants of both the initial and follow-up studies (Belstress I and II).

Material and methods

Participants

In the period between 1994 and 1998, the initial Belstress study (Belstress I) on “job stress and health problems” was conducted in 25 selected companies or large administrations all over Belgium (23). A total of 21,419 respondents aged 35-59 (at the onset of the study) was reached, which is 48% of the invited target population. The study is part of JACE or the “Job stress, Absenteeism and Coronary heart disease – European cooperative prospective study” (24). Participants were requested on a voluntary basis to complete a questionnaire and to attend a medical examination.

TABLE 1
Characteristics of the study population in %.

	MEN	WOMEN	p-value
<i>Age (years)</i>			
35-49	70.4	81.7	<.001
50-59	29.6	19.3	
	(N = 16,329)	(N = 5090)	
<i>Educational level</i>			
Elementary & junior high (low)	43.5	39.4	<.001
High school & some graduate (medium)	28.5	37.3	
College & graduate school (high)	27.9	23.3	
	(N = 16,182)	(N = 5036)	
<i>Occupational grade (ISCO-88)*</i>			
1. Senior Officials & Managers	6.5	1.9	<.001
2. Professionals	11.5	8.3	
3. Technicians & Associate Professionals	17.1	19.3	
4. Clerks	19.3	43.6	
5. Service workers	6.4	5.0	
6. Craft & related trade workers	16.8	2.0	
7. Plant & machine operators/assemblers	17.3	3.8	
8. Elementary occupations	5.1	16.2	
	(N = 15,828)	(N = 4967)	
<i>Sector of employment</i>			
Industrial sector	61.5	22.0	<.001
Private services sector	17.3	37.2	
Non-profit sector	21.2	40.7	
	(N = 16,329)	(N = 5090)	
<i>Shift work</i>			
Day work	68.7	85.0	
Shift work	31.3	15.0	
	(N = 16,120)	(N = 5001)	

* ISCO-88: International Standard Classification of Occupation, 1988-version.

Sample characteristics of the initial cohort are presented in table 1. The sex ratio is 3 to 1. Men have a somewhat older age profile than women (mean age: 45.9 versus 44.3 years, $P < .001$) and are better represented in both the highest and lowest educational groups. According to the ISCO-classification in major occupational grades (25), men do count relatively more managers, professional workers, craft workers and machine operators but far fewer clerks or workers in elementary occupations than women. Men in our sample are predominantly employed in the secondary or industrial sector, while more women by comparison have found employment in the fourth or non-profit sector. Shift work (night or rotating shifts) is much more common in men.

In the year 2001, repeat observations using the same JCQ-scales were done in two firms that collaborated with Belstress I. A total of 594 participants (498 men and 96 women) filled in the repeat questionnaire and attended the medical examination on a free basis. This group so far constitutes the provisional Belstress II sample, as observations are still going on.

Measurement of health outcomes

Current health status

The current health status was assessed with the "Current Health Index" (CHI) which is a Dutch scale including 13 dichotomous items (Yes = 1/No = 0) that add up to scores between 0 and 13 (26). The scale is right-skewed (men: skewness = .66, SE = .020; women: skewness = .23, SE = .036) and was therefore dichotomised. The top quartile group with "high" scores between 7 and 13 is considered to indicate respondents with "poor health" in contrast to all other respondents with none or but few health complaints.

Depression score

The "depression scale" contains 18 questions and is compiled from several other validated scales that screen for non-clinical depressive symptoms such as feelings of loneliness, anxiety or anger, exhaustion, weariness or irritation over the past 2 weeks (27-29). The scale varies between 18 and 54, is right-skewed (men: skewness = 1.13, SE = .020; women: skewness = .69, SE = .036) but displays good internal consistency ($\alpha = .90$ in men; $\alpha = .92$ in women). Scores above 30, constituting the upper quartile group of respondents, are considered to share a "high" depression score.

Measurement of exposure

DCS-scales

We used the full recommended 1985-version of the Job Content Questionnaire (15) which is a self administered questionnaire measuring perceived “psychological demands” (9 items), “decision latitude” or “job control” (9 items) and “social support” (8 items). In case of one missing value per (sub)scale, the mean value which is calculated over the set of remaining valid (sub)scale-items for that particular respondent was imputed, picking up 5% more valid cases at most. Dichotomies for these scales were defined by the gender-specific median split yielding high and low values for each scale (5). “High demands” refer to values strictly above the median, “low control” and “low support” refer to values strictly below the median in each gender. “High strain” refers to the gender-specific combination of high levels of job demands with low levels of job control. The other combinations define the remaining exposure categories: “active” (high demands & high control), “passive” (low demands & low control) and “low strain” (low demands & high control).

Job insecurity

Perception of job insecurity was measured with two questions from the JCQ instrument (15) evaluating the respondent’s assessment of his or her present (my job security is good) and future situation (how likely to lose your job in the years to come). Each question has four outcome categories, ranging from 1 (fully agree/very unlikely) to 4 (fully disagree/very likely). Sum scores on the job insecurity scale vary between 2 and 8. The scale was dichotomised on a content basis yielding “low” (scores 2-4) and “high” (scores 5-8) levels. The top quarter of cases fall in the group with high scores for job insecurity.

Impact of world market competition

The JCQ “impact of world market competition” (WMC impact) is an additive scale composed of three questions designed to survey the perception of the impact of competition from world trade on the respondent’s own job security, work pace (demands-related) and thirdly, power and influence over the way things are organised at the workplace (control-related). Each item compares the present situation to a previous time period and shares the same four outcome categories ranging from 1 (fully disagree) to 4 (fully agree). Sum scores on the impact of world market competition scale vary between 3 and 12 ($\alpha = .83$ in men; $\alpha = .85$

in women). The scale was dichotomised yielding “low” (scores 3-8) and “high” (9-12) levels. The top quarter of cases fall in the group with a high level of perceived threat from world market competition.

Statistical analysis

Scale reliability is indicated by the “internal consistency” of scale items as measured by Cronbach’s alpha (α). Alpha values in the range between .65 and .90 are considered acceptable (30). Scale validity is evaluated through a common factor analysis using orthogonal maximum likelihood extraction and rotation of factors (31). Factor loadings greater than .40 are considered to be meaningful loadings on a component or common factor (1, 32).

Age-standardized prevalence rates of “high” outcome levels (poor health, depressive mood) by job strain exposure category and by level of job insecurity or WMC impact per gender were calculated using the direct method with the 5-year distribution in each gender group as a reference (33). The chi-square test was then used as an inferential test.

Logistic regression analyses were used to calculate adjusted odds ratios comparing the estimated odds of the exposure category to the estimated odds of the reference category (“no high strain” for the job strain variable; “low” level of job insecurity or of WMC impact). In view of the large sample size, α was set at .01; accordingly 99% confidence intervals (99% CI) were calculated. Adjustment in each gender was made for the set of socio-demographic variables that proved to be covariates of both outcome and exposure variable: age, level of education, occupational class, sector of employment, shift work. External locus of control (LOC) was also used as a statistical control variable because work environment assessments of “distant forces” connected with the global economy may just reflect this personality trait. It was evaluated by two questions derived from Pearlin and Schooler’s well regarded short scale of mastery orientation (34).

Finally, in comparing results from Belstress I an II, the Wilcoxon Signed Ranks Test and the McNemar Test for paired observations were used to test for differences (35).

Results

Scale reliability and validity

Table 2 gives the observed range, mean, coefficient of variation and alpha value for each of the JCQ-scales. In both gender groups alike,

TABLE 2
Distribution and internal consistency of Job Content Questionnaire scales, by gender (Belstress I)

Dimensions	No. items	Range	Men (N = 15,329)		Women (N = 5090)		α
			mean	CV	mean	CV	
Physical demands	5	5-20	9,2	35,1	9,7	34,6	.85
Psychological demands (core version)	5	12-48	30,8	20,4	31,5	19,9	.72
Psychological demands (extended version)	9	9-36	23,5	17,8	23,2	17,6	.77
Decision latitude	9	24-96	69,7	17,3	63,9	19,3	.82
– Skill discretion	6	12-48	34,9	17,6	31,6	20,8	.78
– Decision authority	3	12-48	34,8	20,7	32,2	22,8	.65
Total social support	8	8-32	22,8	15,6	22,6	16,6	.85
– Supervisor support	4	4-16	10,8	23,4	10,7	24,2	.88
– Co-worker support	4	4-16	12,1	14,8	11,9	15,9	.83
Job insecurity	2	2-8	3,7	35,8	3,8	34,9	.68
Impact of World Market Competition	3	3-12	7,2	32,1	6,3	34,6	.85

Notes:

- Belstress I: observations between 1994-1998.
- CV = coefficient of variation, in %; α = Cronbach's alpha.
- All gender differences in means are significant at the .01 level according to the t-test, except for "supervisor support" ($P = .025$).

scores vary over the whole scale range. The clearest differences in mean scores between men and women are observed with respect to decision latitude and impact from world trade: women in general perceive less job control than men but also feel less threatened by environmental factors linked to the global economy.

Estimated values for Cronbach's alpha are fairly high, indicating acceptable levels of internal consistency for each of the scales. Moreover, the same pattern is observed in both gender groups. The higher alpha-value for decision latitude compared to psychological demands, should be remarked.

Table 3 gives the main results from the factor analysis. Initially, a solution with nine common factors explaining 54% of the total variance

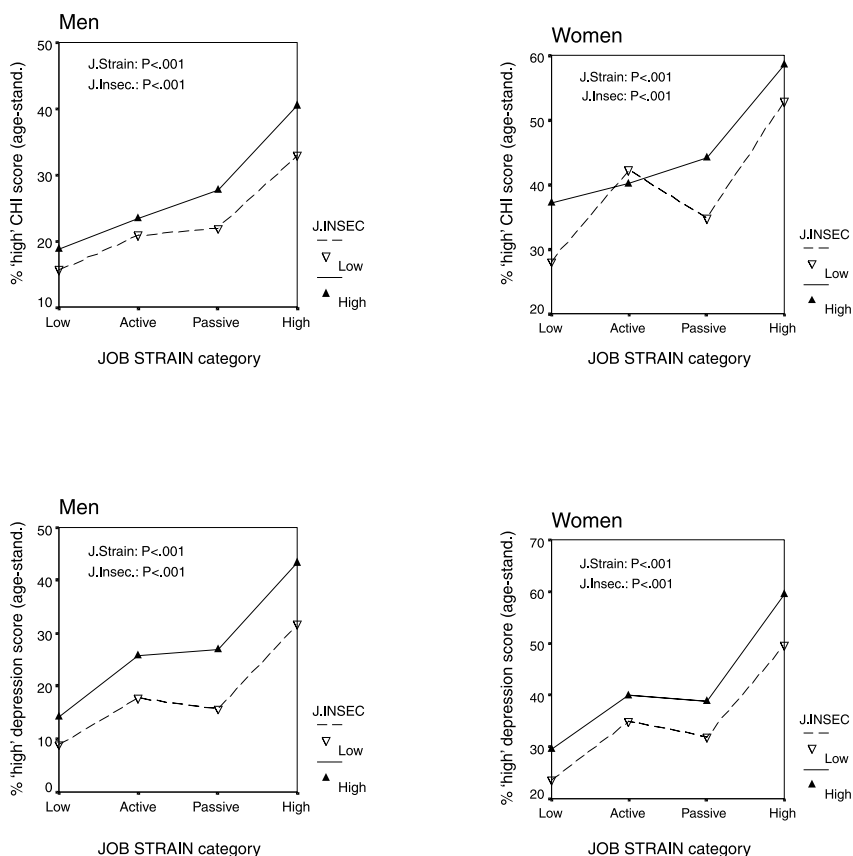


Fig. 1: Age-standardized association between health status indicators and job strain within levels of job insecurity by gender.

was produced. However, no high loadings ($\geq .40$) on the ninth factor were observed. A forced solution with eight factors produced a “simple factor structure” with common factors that coincide with the constructs set out by theory and explaining 51% of the total variance. The first extracted common factor is clearly related to Decision Latitude. Only the item “repetitive work” is set apart. The second factor relates to Psychological Demands, without any discrimination of items that belong to the core or the extended version. Here, two items are set apart, “no conflicting demands” and “wait on others”. Supervisor Support and Co-worker Support are clearly differentiated. Physical Demands is split into two factors, the first one indicating physical exertion, the other one indicating static exertion. Note also that Job Insecurity and Impact from World Market Competition as constructs are clearly discerned from one another.

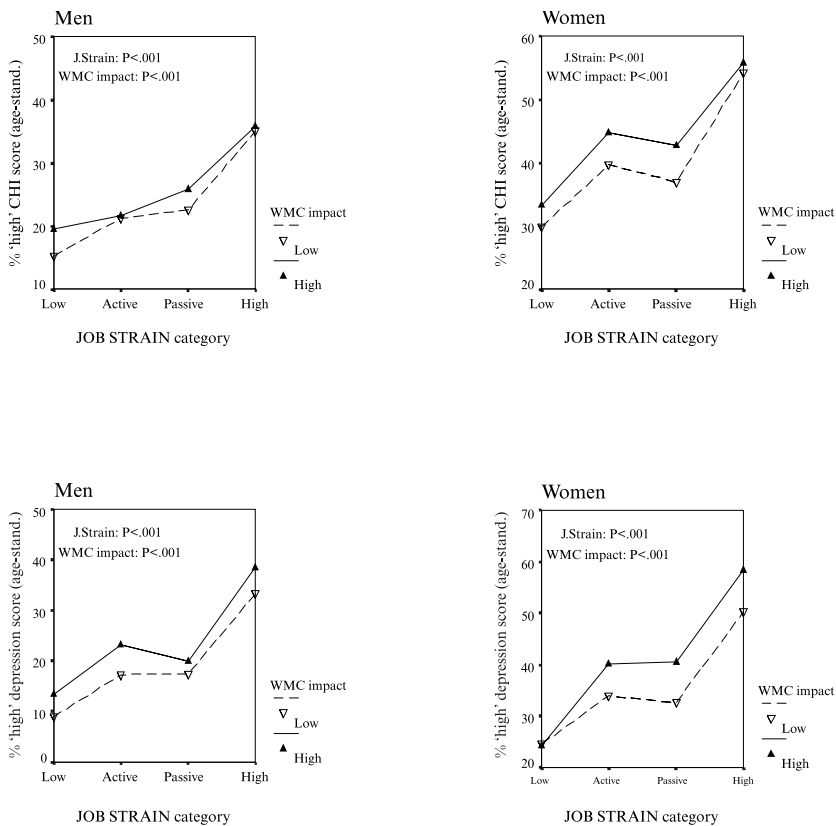


Fig. 2: Age-standardized association between health status indicators and job strain within levels of impact of world market competition (WMC) by gender.

TABLE 3
 Exploratory Factor Analysis: Maximum Likelihood extraction of Common Factors and Varimax Rotation (Belstress I: N = 17,189)

	I	II	III	IV	V	VI	VII	VIII	h ²
<i>Decision Latitude</i>									
Allows own decisions (DA)	.69		.24		.12				.49
Develop own abilities (SD)	.69								.55
Requires creativity (SD)	.66		.20						.50
A lot of say (DA)	.68	.17							.49
Variety (SD)	.65								.44
High skill level (SD)	.56	.27							.40
Learn new thing (SD)	.51	.23		-.18					.35
Little decision freedom (DA) (-)	.43	-.11		-.18					.24
Repetitive work (SD) (-)	.34			-.24					.19
<i>Psychological Demands</i>									
Work very hard*	.12	.75		.10					.59
Work very fast*	.12	.73		.11					.55
Hectic job		.69							.52
Enough time* (-)		.62	-.13						.42
No excessive work* (-)	.26	.52							.29
Intense concentration	.27	.46				.10			.31
Tasks interrupted		.44		-.20					.32
No conflicting demands* (-)		.23	-.19		-.10				.11
Wait on others		.22			-.11		.18		.12
<i>Supervisor Support</i>									
Supervisor pays attention	.23		.79		.14				.71
Supervisor concerned	.15	-.12	.78		.13				.67
Helpful supervisor	.13		.73		.15				.58
Supervisor good organizer	.10	-.11	.71		.22				.58

TABLE 3 (continued)
 Exploratory Factor Analysis: Maximum Likelihood extraction of Common Factors and Varimax Rotation (Belstress I: N = 17,189)

	I	II	III	IV	V	VI	VII	VIII	h ²
<i>Physical exertion</i>									
Rapid work	-.15			.83			.17		.74
Much physical effort	-.11			.81			.13		.69
Heavy physical load	-.17	-.10		.73			.22		.63
<i>Co-worker Support</i>									
Friendly co-workers			.11		.77				.62
Co-workers helpful	.10		.15		.74				.59
Co-workers interested in me	.14		.16		.70				.54
Co-workers competent			.17		.58				.37
<i>World Market Competition impact</i>									
Work harder		.22				.86		.11	.81
(More) Job insecurity						.77		.25	.66
Loose power and influence		.11				.71		.13	.55
<i>Static exertion</i>									
Difficult head and arm positions	-.17							.36	.81
Difficult body positions	-.17							.41	.79
<i>Job Insecurity</i>									
Likely to be laid off							.80		.81
Present job security is good (-)	-.12						.77		.79
% variance explained (after rotation)	10.1	8.5	7.2	6.7	6.1	5.6	3.9	.68	.55
% Total variance explained	50.8							.65	.50
KMO sampling adequacy	.86							2.8	

Notes:

- Belstress I: observations between 1994-1998.
- * = items belonging to the core-version of Psychological Demands.
- (-) = Item formulated in negative direction, its score has been reversed before factor analysing.
- Loadings on Common Factors and communalities (h²) are rounded to two decimal places. Loadings ≥ .10 are mentioned; highest loadings ≥ .40 are in bold.

Association of the new constructs with health indicators

Figure 1 displays the age-standardized prevalence of a high level of the current health index (CHI) and of the depression scale by categories of job strain exposure within levels of perceived job insecurity per gender. Self-reported poor health or a depressive mood is clearly associated with high job strain, but on top of that, it is also associated with a high level of perceived job insecurity. Only in women having an active job, the prevalence of self-reported “poor health” is not higher in the group perceiving a high level of job insecurity compared to the group perceiving a low level of job insecurity.

Figure 2 also displays the age-standardised prevalence for both health indicators, but this time by category of job strain exposure within levels of perceived impact from world market competition per gender. Again, the clear association between the considered health outcomes and high job strain is demonstrated but also a positive association between health perceptions and perceived impact from world trade is indicated.

Figures 3 and 4 show results from logistic regression analyses. It is indicated that both new constructs, perception of job insecurity and perception of impact from world market competition, are independently and positively associated with both health outcomes after adjustment is made

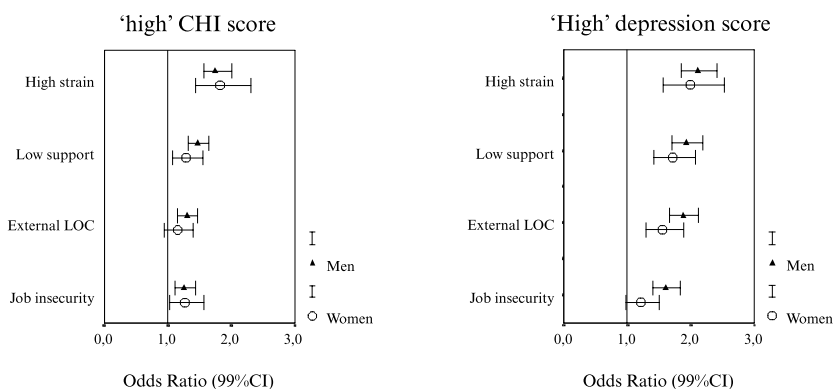


Fig. 3: Adjusted association of health status indicators and exposure to job stressors including “job insecurity”. Results of logistic regression (1).

(1) The model additionally adjusts for age group (5 yrs), level of education, occupational grade, sector of employment and shift work. The job strain variable was also dichotomised (high strain/else) and is gender-specific.

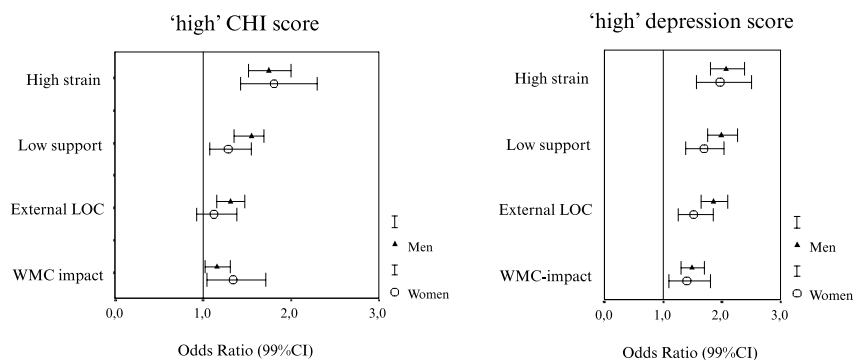


Fig. 4: Adjusted association of health status indicators and exposure to job stressors including “impact of world market competition” (WMC). Results of logistic regression (1).

(1) The model additionally adjusts for age group (5 yrs), level of education, occupational grade, sector of employment and shift work. The job strain variable was also dichotomised (high strain/else) and is gender-specific.

for socio-demographic and other covariates mentioned. The association however is not very strong, or at least not as strong as the positive association between either health outcome and high job strain. Moreover, none of the added multiplicative interaction terms between high job strain exposure and level of job insecurity or level of impact from world trade, were found to be significant at the .01-level.

The changing nature of the psychological work environment

In table 4, mean scores on each of the JCQ-scales at time periods T1 and T2 are compared. Looking at the P-value for differences in means, it is indicated that only the added new constructs show a significant rise in mean scores.

A closer look at the items in figure 5 connected with both concepts learns that all items display a significant rise over time in the proportion that feels threatened either by job insecurity or by the global economy dynamics. Most markedly, a sharp rise in the proportion of perception of future job insecurity (“likely to be laid off”) is depicted.

Discussion

The comparison of scale means for the set of scales connected with the extended job strain model learns that the Belstress-I findings do not

TABLE 4
 Mean scores and standard deviation on Job Content Questionnaire scales at observation periods T1 and T2,
 in participants of Belstress I & II (N = 594)

Scale	Period T1		Period T2		P-value
	Mean	SD	Mean	SD	
Physical demands	9.7	3.24	9.6	3.05	.89
Psychological demands (extended version)	22.3	4.14	22.4	4.07	.34
Psychological demands (core version)	29.1	6.25	29.3	5.89	.48
Decision latitude	68.5	11.84	68.7	12.23	.54
– Skill discretion	34.0	6.0	33.9	6.25	.70
– Decision authority	34.5	7.28	34.7	7.19	.38
Social support	22.9	3.88	23.1	3.64	.34
– Supervisor support	10.8	2.62	11.0	2.57	.11
– Cow-worker support	12.1	2.04	12.1	1.91	.60
Job insecurity	3.3	1.18	7.0	2.54	<.001
World trade competition	6.5	2.53	7.0	2.45	<.001

Notes:

- T1 = 1994-1998; T2 = 2001-2002, observations in two firms only.
- P-value of Wilcoxon Signed Ranks Test for paired observations.

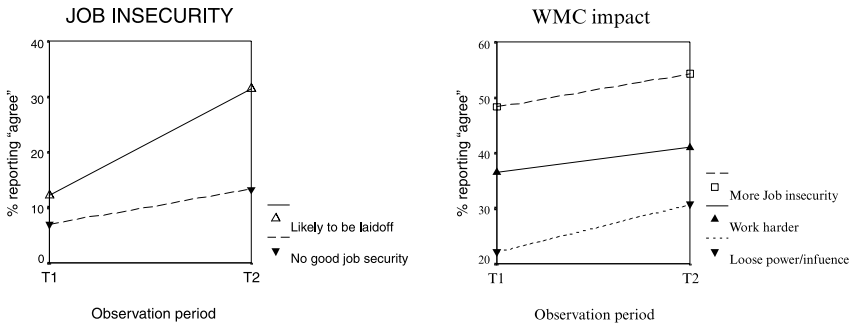


Fig. 5: Changes in perception of items connected with “job insecurity” and with “impact of world market competition” (WMC) between observation periods T1 and T2 (¹).

(¹) T1 = 1994-1998; T2 = 2001. All changes are significant at the .05 level according to the McNemar Test for paired observations.

markedly deviate from what has been observed elsewhere, even if samples may differ in age span or range of occupations (36). Besides, the same similarities and disparities between the gender groups are observed. Typically, men in general score higher on the Decision Latitude scale and on both its subscales than women (32, 36). At the same time, men feel more threatened than women by processes at the global economy level beyond their control.

All JCQ-scales in the large Belstress-I cohort show acceptable or even good internal consistency reliability. In line with observations in other studies, Psychological Demands reach a lower value for internal consistency than Decision Latitude (32, 36-38). In this respect, some scholars have suggested to make a clear distinction between “quantitative” and “qualitative” psychological job demands. More particularly, it is proposed that the 5-item psychological demands scale builds up the international JCQ-standard to measure quantitative demands, and if needs be, can be supplemented by a varying number of new items designed to capture qualitative cognitive and emotional job demands within specific job settings (39).

A “simple factor structure” is observed in line with its theoretical presumptions. Generally, the pattern confirms Karasek’s DCS-model and also discriminates well between the new added scales, Job Insecurity and threat from World Market Competition. It should be noted that all items connected with the Decision Latitude sub-scales, Decision Authority and Skill Discretion, do intermingle. This was also observed in

the Quebec-Canadian white-collar study (32). Some authors however claim that a more focused measure of job control is needed in order to demonstrate a buffering effect of job control on the relationship between job demands and health outcomes (40-43). More precisely, the idea is that specific job control measures should match specific job demands. At least in the Dutch study among software engineers and university staff, it was demonstrated that an oblique three-factor model for Psychological Demands, Decision Authority and Skill Discretion was most appropriate to fit the data (41).

The few items that do not load high on common factors of the DC-model are typically those that had already been reported in other studies. The standing apart of the item "repetitive work" for instance is well reported (36-37, 40, 44). For Karasek et al., it is "the most troublesome" Decision Latitude item (36). Noteworthy is that in the factor analysis presented here, with its inclusion of items connected with Physical Demands, there is some weak indication that the item also refers to Physical Exertion. Likewise, the deviant items connected with the Psychological Demands factor, "(no) conflicting demands" and "wait on others", were also signalled in other studies (36, 38).

Besides, some studies prefer the so-called "job title method", in which inferred mean scores on the job stress scales by job title are attributed to all subjects having the same job title whatever the study (5). Classification of subjects in the quadrant scheme of the job strain model is then based on these mean scores and not on individual scores on the job stress scales as can be derived from a self-administered questionnaire. A major drawback of this method is that it may lead to misclassification of exposure insofar as it does not take into account the within-occupational variance, which moreover is quite substantial in many occupations (45). The misclassification in turn carries the risk of an underestimation of the true effect of exposure to job strain on health outcomes. This of course may explain why studies using the job title method generally show less strong associations between job strain exposure and a health outcome compared to studies using individual classifications based on a self-administered questionnaire (7).

Conclusions

Basically, our analysis on the relationship between psychosocial job stress factors and subjective health outcomes, like self-reported current health status or depressive feelings, corroborate the job strain model. The important point in this context is that the added new factors, per-

ceptions of job insecurity and of impact from world market competition on one's job, are also positively and independently associated with these ill-health outcomes, although associations are rather weak. Admittedly, cross-sectional associations are far from proof for cause-effect relationships whatsoever. The findings however do fit into a vast corpus of evidence including longitudinal studies that demonstrate a relationship between job insecurity or the threat of job loss and ill health, particularly with respect to psychological distress (21, 46). For that reason, we think it plausible that both perceptions related with the wider economy indeed have an effect on the wellbeing of workers. Besides, its effect might eventually turn out to be even stronger than indicated by the strength of reported associations, because a bias towards the null due to the "healthy worker survivor effect" (47) cannot be ruled out beforehand.

The above is of course new ground for further research. The challenge is to see whether these perceptions do not only have an impact on feelings of distress or the self-rating of one's own health, but to investigate whether prolonged exposure to job insecurity or continual re-conversion of jobs is detrimental to the health condition as indicated by objective standards. More specific questions need to be addressed, as for example what segments of the labour force feel most affected by changes at the organisational and global economy level and to what extent does that in due course relate with specific health complaints? Do these factors affect men and women in a different way during their lifetime and what are their effects on the interplay between work and family responsibilities? As an extension of the job strain model, it may allow the model to meet requirements of its rival paradigm as incorporated by the ERI-model, or even may inspire to some form of synthesis. Indeed, not only day-to-day demands and control come into the focus of attention, but jobs also get more properly evaluated within a lifecycle perspective.

Definitely the most intriguing finding is that precisely among the whole set of measured psychosocial job stress dimensions, the perceptions of job insecurity and of impact of world market competition on one's own job are the only indicators that show a rise over time. So far, these are provisional Belstress-II findings, but they plausibly reflect recent changes in the psychosocial work environment. Rapid changes in the global economy may pose a problem of adaptation. Apparently, a growing group of workers feels it is losing grasp on their own (working) life. Although our own findings suggest that we may not exaggerate its impact on health perceptions, this is no reason to ignore its long-term effects. Evidence in the field of cardiovascular diseases (CVD) for instance suggests that

precisely lack of power, control and mastery over one's own life is a key factor in explaining of the social gradient in CVD (48). This may provide but one more argument that points to the necessity to further monitor effects of processes at the organisational and economy level on the health of workers.

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