

## Recent Developments in Work Conditions and Related Research in Sweden

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### General background

Sweden differs from other countries in western Europe from several points of view. The most important one from a national stress perspective is that we used to have an active national policy against unemployment. In the late 1980:s and early 1990:s the unemployment rates started to rise from approximately 3%. They have more or less been stabilized on a 10% level. At the same time life became more difficult financially for the unemployed and in particular there are unemployed single parents who now have difficulties to give their children a good upbringing because of financial problems. We are beginning to talk about social shame as a problem in these groups<sup>1)</sup>. A recent publication from Statistics Sweden<sup>2)</sup> which is of great help is based upon repeated survey studies (interviews) of random samples of working Swedish men and women during the years 1975–1995. Table 1 from this publication shows that during these years, work has become more stimulating but also more psychologically demanding. Work is also performed in more inconvenient postures than twenty years ago—perhaps partly a consequence of modern technology. On the other hand noise has become less of a problem. With regard to gender differences we notice that

the changes have been more marked for women than for men, with the exception of noise which decreased significantly for men but did not change for women.

The changes have not taken place linearly during this whole period. There was a long period from the mid 1970:s to the late 1980:s when working conditions improved in our country, according to welfare statistics during these years. Thus, work became more interesting and workers were allowed more freedom to decide about various aspects of their own work during these years. Psychological demands did not change during this period but surveys showed that during the late 1980:s demands began to increase beginning with women in service and care but then also with other groups. At the same time there has been a dramatic increase in the proportion of temporarily employed men and women in the labour market—along with the increase in unemployment rates.

Several authors have pointed out that in Sweden like in many other postindustrial countries the possibilities for workers with a low level of education to become steadily employed has decreased. The numbers of jobs that do not require a formal education exceeding the mandatory level is decreasing.

There has been some decrease in the dif-

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**Table 1** Development of quality of working life, random Swedish working men and women 16–64 years of age (asterisk indicates statistically significant trend)

		% change 1975–1995	% pervalence 1992–1995
Possibilities to learn			
new things	males	+ 8.5*	67.7
	females	+ 16.2*	60.6
Psychological effort			
	males	+ 4.9*	38.9
	females	+ 15.6*	46.4
Deafening noise all the time			
	males	– 5.9*	11.8
	females	– 1.1°	5.0
Inconvenient postures			
	males	+ 5.9*	41.6
	females	+ 15.7*	42.1

Source: Welfare and inequality in a 20-year perspective 1975–1995 Statistics Sweden number 91, 1997

ference between men and women with regard to amount of household work. It is still true that men have longer hours in paid work than do women, but the differences are diminishing somewhat and men take over a little more of the unpaid work<sup>2)</sup>.

The changes that I have described are also mirrored in a general sense that perceived “stress” has become more common both in men and women during later years according to population surveys in our second largest city Göteborg<sup>3)</sup>. Studies of the total cardiovascular risk pattern there show that the prevalence of smoking and hypertension are decreasing but that perceived stress and overweight are becoming more common in the population of men and women.

How do these dramatic changes in the labour market and working conditions influence the wellbeing of Swedes? So far we have not seen increasing mortality or any other decline in “hard endpoints”. For cardiovascular morbidity and suicide we have seen decreasing levels for both men and women also in the 1990:s although a deceleration seems to take place. For softer endpoints, however, there have been clear effects in the population. Prevalences of tiredness, disturbed sleep and anxiety have been analysed. There are elevated rates of these “soft indicators” of mental ill health. This elevation coincides with structural changes

mentioned above. Also for the prevalence of attempted suicide (based upon hospital statistics) the structural changes are reflected in the population’s mental health<sup>4)</sup>.

What is the likelihood that the psychosocial changes in the Swedish working life will ultimately result also in increasing rates of heart disease and mortality?

In response to that question I would like to make a number of points:

1.) Applying the demand-control-support model<sup>5, 6)</sup>, we are facing a situation with increasing demands-potentially a deterioration (see below) for every worker. For social support there may also be a deterioration since the increasing prevalence of paid home work decreases the physical possibilities to meet (mainly a high education group problem) and the temporary employments mixed with periods of unemployment decreases the basis for social support at work (mainly a low education group problem). For control (decision latitude) which is perhaps the most important dimension in relation to risk of myocardial infarction (see Theorell and Karasek 1996<sup>7)</sup>) there will be differential effects for low and high education groups, with deterioration in the former and improvement in the latter group. Thus there is risk of increasing social inequality with regard to cardiovascular risk, and indeed this already seems to be ongoing<sup>8)</sup>.

2.) Job conditions are of course only one of several risk factors. In the SHEEP<sup>9)</sup> we have calculated the risk of developing a first myocardial infarction on the basis of a relatively large case-referent study. In this study methodological studies indicated that recall bias was not a serious problem, and we also had the possibility of adjusting for a number of accepted risk factors, including social class. The risk factor pattern and the relative risks that we observed were similar to those in other Scandinavian studies<sup>6), 10)</sup> and therefore we considered it meaningful to calculate the etiological fraction associated with high demand and low decision latitude (job strain, here operationally defined as the worst quartile of the distribution of the ratio between demand and decision latitude). The calculation of etiological fraction is presented in Table 2. The result (Table 3) indicates that the etiological fraction differs between ages and between

**Table 2**

Etiological fraction (EF) for job strain (Ratio Psych Dem/Dec Lat, highest quartile for total male and total female study population, respectively) in relation to first myocardial infarction based upon SHEEP (Theorell, Tsutsumi, Hallquist, Reuterwall, Emlund et al 1998, Am. J. Public Health). Adjusted for medical risk factors

$$EF = P* \frac{RR - 1}{RR}$$

Men 45-54: 11% (RR = 1.8)  
 Men 45-64: 7% (RR = 1.4)  
 Women 45-64: 13% (RR = 1.4)

EF = The proportion of first MI:s that could be prevented if the fourth of the population with the most job strain could obtain as good working conditions (with regard to job strain) as the remaining 75% in this age/gender group

**Table 3**

Etiological fraction for loss of decision latitude (measured indirectly). Exposure defined as the fourth of the total male and total female study population respectively with the worst development of decision latitude during preceding ten years. Adjusted for medical risk factors. SHEEP 1998 (Theorell, Tsutsumi, Hallquist, Reuterwall, Emlund et al Am J Public Health)

Men 45-54 14% (RR = 1.8, wexposure 32%)

For older men and for women no association

genders. The most established and highest fraction is the one seen for men in the ages 45 to 54. In this group the potential effect of improving job conditions for those 25% with the worst conditions is comparable to the potential effect of lowering serum cholesterol but lower than for decreased smoking. Also for women the relative effect of improved conditions could be substantial.

If the potential effect of improving shift work (which has an independent effect on risk as well, see Knutsson et al 1999<sup>11)</sup>) could be added, the total effect of improving working conditions could be even greater.

Since working conditions constitute only one of several groups of risk factors (see Reuterwall and others, 1998<sup>12)</sup>), the effect of deteriorating job conditions may be concealed

by other changes. Smoking patterns are improving, for instance, and this could of course partly explain why the incidence of myocardial infarction is not increasing despite deteriorating working conditions in our country. We also know from the SHEEP and other studies that blue collar workers are more vulnerable<sup>8)</sup> to job strain than others. Therefore, a differential analysis and prevention strategy should be applied.

3.) There is also a lag phenomenon. In the case of decreased decision latitude we had the possibility within SHEEP to study changes in decision latitude indirectly. This was done by means of an imputation method<sup>13)</sup>. The 25% with the worst development of decision latitude during the past 10 years was operationally defined as the exposed group. We showed<sup>9)</sup> that men in the ages 45-54 had an elevated risk of developing a myocardial infarction (1.8) which corresponded to a substantial etiological fraction (Table 3). The most interesting observation, however, was that in most cases there was a latency of approximately five years between the loss of decision latitude and the first myocardial infarction. This means that it would be possible to prevent many of these myocardial infarctions in these vulnerable men. In the study of Johnson et al<sup>14)</sup> we observed that there was (up to approximately 15-20 years of exposure) evidence of accumulated effects of lack of decision latitude

4.) The silence has been increasing in our society. The willingness to speak up about bad conditions has decreased since there is increasing risk of losing one's job. This may have a profound effect also on population health. There is already clear indication from insurance statistics that our long term sick leave prevalences have increased recently-after the short sick leave prevalences decreased dramatically as a consequence of changes in the system. Interpretation of insurance statistics is always a difficult matter, however. There may be other explanations of this trend.

In conclusion there is reason to feel worried. It is possible that the favourable trends in our population health will be broken and there are already signs (in soft indicators) that this is happening. However, it will be important to analyse the public health phenomena differentially. Perhaps the most important development is the widening social gap.

### Physiological mechanisms

When the organism deals with elevated demands for action in physically or psychosocially adverse (the brain makes no distinction between physical and psychosocial) conditions, energy mobilization is a central theme. Energy mobilization is associated with a number of changes which are all focussed on the preparation for physical action. Accordingly, pain regulation (insensitivity), coagulation (increased), electrolyte balance (retained water and salt) and immune processes (dampening of inflammatory responses as well as partially strengthened immune defense) are examples of changes that accompany the acute energy mobilization itself which is manifested in the release of carbohydrates and fatty acids to the blood.

Energy mobilization is often accompanied by down-regulated anabolism. The restoration and rebuilding of tissues which is the anabolic task receives a lowered priority during crisis conditions.

All of the processes mentioned above could be and have been related to job stress and job stressors. Just to mention a few examples of studies that relate job stressors to biological markers:

Physiological recordings have shown that *blood pressure* during job activities is related to job strain, particularly in men (for reviews see Schnall and others 1998<sup>15)</sup> and Theorell and Karasek 1996<sup>7)</sup>). In men casual blood pressure has been shown to be associated with a poor effort-reward balance<sup>16)</sup> in men.

For *blood lipids* the findings are more mixed, but there are epidemiological studies which show that an unfavourable ratio between the “bad” and the “good” cholesterol (LDL/HDL) is associated with poor effort-reward imbalance in men<sup>16), 17), 18)</sup>. So far the findings in relation to decision latitude and demands have been ambiguous.

Both Japanese<sup>19)</sup> and Danish<sup>20)</sup> studies have shown a relationship between longterm regulation of *carbohydrates* (as reflected in the blood concentration of glycated hemoglobin) on one hand and job strain on the other hand.

Fibrinogen has been shown to be associated with a low decision latitude in several studies. The two most recent ones that are based upon

the Whitehall study<sup>21)</sup> and the referent group in the SHEEP study<sup>22)</sup> show that a low decision latitude is associated with elevated plasma fibrinogen concentration particularly in women and when more indirect measures of decision latitude are used. Plasma fibrinogen, however, has been known for a long time to rise in psychosocial crisis situations (see for instance Wolf 1969<sup>23)</sup>).

Longterm exposure to adverse psychosocial conditions may give rise to a disturbed hypothalamo-pituitary-adrenocortical (HPA) response pattern in acute stress situations. The natural response to an acute stressor is elevated serum cortisol. When this response does not take place there may be a disturbed regulation that could have been caused partly by repeated arousal situations. A comparison between Swedish and Lithuanian male cardiovascular risk patterns<sup>24)</sup> has recently shown that the Lithuanians from many points of view had a much worse psychosocial work situation and in these men the cortisol response to acute stress was blunted. These men also had a high load of biological cardiovascular risk factors. The work situation was clearly embedded in a general social situation in these cases and accordingly outside work factors may also have been important.

There may be two kinds of regulatory disorders, constantly high cortisol levels (as in psychiatric depression) and constantly low levels (as in the chronic fatigue syndrome, according to Demitrack et al<sup>25)</sup>). Fatigue and vital exhaustion are conditions that have been related to high lipids. For instance, Shirom et al<sup>26)</sup>, in their epidemiological study of Israeli workers, showed that a high burnout score was associated prospectively with rising serum cholesterol. In a study in Malmö<sup>27)</sup> shipyard workers (Kockums) who became unemployed were shown to have rising serum cholesterol levels and this rise was pronounced among those who had financial insecurity and particularly if they reported sleep disturbance during the crisis period. No corresponding rise took place in the referent population. Rosmond et al<sup>28)</sup> have recently shown that a low salivary cortisol concentration with small variability is associated with increased metabolic sensitivity to daily stressors and to the metabolic syndrome.

In a recent epidemiological study of 250

men and women we have shown that a small difference between morning and midday serum cortisol concentrations is associated with elevated levels of interleukine 6 which is one of the substances that are instrumental in the communication between the brain and the immune system<sup>29)</sup>. In male participants, a low decision latitude was associated with a high serum interleukine 6 concentration. We have also shown<sup>30)</sup> previously that the slowly reacting immunoglobulin G rises during periods of increasing job strain. These are studies that may illustrate that the immune system is involved in the regulatory disorders. Since the immune system may also be involved in the atherosclerotic process itself, this may be of great importance.

The *anabolism* indicators have also been studied in relation to job stress. Decreasing testosterone levels were observed with increasing job strain in one of our own studies<sup>31)</sup>, and a recent study of policemen<sup>32)</sup> showed that job loss with subsequent regain of jobs was associated with rising testosterone concentration one year later.

In conclusion, in future psychophysiological research in this field there is a need for more detailed studies of regulatory disorders. Thus we shall need to study variability of hormones and we need to relate disturbance in endocrine responses to all the systems that are of potential importance to the development of cardiovascular and other illnesses.

#### **Other needs in future research:**

There is growing awareness that we know too little about the health effects of *long working hours*. For a long time very few studies on the relationship between working hours and cardiovascular risk have been published. Preliminary results from recent epidemiological studies in Stockholm indicate no consistent relationships between working hours and risk of a first myocardial infarction (SHEEP, personal communication Hallquist 1998<sup>8)</sup>). It may very well be, however, that we should improve our analytical strategies in this field. For instance, particularly for women it may be important to analyse the *total work load* (paid and unpaid work), and it may be important to differentiate between *voluntary and involuntary* overtime work as well as between

*different types* of work. For instance, overtime work in a stimulating kind of job will be more easily tolerated than overtime work in a monotonous job that requires constant attention. A recent Japanese study has shown that a moderate amount of overtime work may be associated with elevated risk of developing a myocardial infarction<sup>33)</sup>.

There is growing evidence, on the other hand, that pronounced exhaustion states (for instance vital exhaustion) is associated with marked elevation of myocardial infarction risk. Appels and coworkers<sup>34)</sup> have studied this relationship extensively and with increasing sophistication. Even when the analyses have been adjusted for biological cardiovascular risk factors a clear relationship between vital exhaustion and myocardial infarction risk has been observed. Recently a study of the relationship between coagulation, fibrinolysis and vital exhaustion showed that fibrinolysis was inhibited in vital exhaustion. Accordingly the balance between coagulation and dissolution of clots was disturbed<sup>35)</sup>.

Experimental studies of sleep deprivation as well as a recent Dutch real life study of long distance truck drivers<sup>36)</sup> have illustrated that there are marked disturbances in endocrine functions at the end of a period with no or very little sleep.

There is a strong need for expanded knowledge regarding the effects of long working hours in all of our countries and it is my hope that we shall be able to start a collaborative programme. It should include both epidemiological and more detailed studies of mechanisms.

The main field that we should focus on, however, is intervention research. It will be impossible to perform ideal double blind studies of the effects of psychosocial job interventions, however. What should be recommended is the study of spontaneous experiments in which efforts should be made to find as good a comparison group as possible. A study that was conducted by our institute<sup>37)</sup> may illustrate difficulties and possibilities. We were asked by the occupational health care team to evaluate the whole package of psychosocial intervention, including exploration, feedback and structured intervention on the basis of feedback. The aim was specifically to increase decision latitude and social support. The referent

population was a work site with similar work tasks (office work). An improvement of lipoprotein patterns (LDL/HDL) by 6% was observed in the intervention group whereas no change was observed in the comparison group. The changes seemed not to be explained by changes in life style. The amount of change is probably what could be achieved in experiments of this kind. What complicates the interpretation, however, is that the intervention was both organization and individual oriented. Thus we cannot know whether the observed change is due to individual improvement in stress management or changes in organizational climate. On the other hand this is a dilemma that we shall probably have to live with, because all practitioners in the field agree that attention to the individuals improves the effect of organizational intervention and vice versa!

In an ongoing study we are evaluating the effects of a programme lasting for a year aiming at improved managers who shall be able to see the needs of their employees. The goal of this intervention is to increase decision latitude and social support for the employees in the organization. There are 300 participants altogether in the intervention and comparison groups. The two work sites belong to the same organization and have similar work tasks. Structural changes are expected in both work sites but the programme is expected to improve the possibilities for the employees to cope with these changes. Perceived work environment, mental health, personal habits for instance with regard to smoking and a number of metabolic and endocrine blood parameters are being followed before, during the mid phase of the programme, immediately after the end of the programme and finally after one year of follow-up.

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