Original Contribution

Psychosocial Work Environment and Incidence of Severe Depressive Symptoms: Prospective Findings from a 5-Year Follow-up of the Danish Work Environment Cohort Study

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The authors analyzed the impact of psychosocial work characteristics on the incidence of severe depressive symptoms among 4,133 (49% women) employees from a representative sample of the Danish workforce between 1995 and 2000. Psychosocial work characteristics at baseline included quantitative demands, influence at work, possibilities for development, social support from supervisors and coworkers, and job insecurity. Severe depressive symptoms were measured with the five-item Mental Health Inventory of the 36-item Short-Form Health Survey, with a cutoff point of 52. Women with low influence at work (relative risk (RR) = 2.17, 95% confidence interval (CI): 1.23, 3.82) and low supervisor support (RR = 2.03, 95% CI: 1.20, 3.43) were at increased risk for severe depressive symptoms after exclusion of cases at baseline and adjustment for sociodemographic factors, baseline depression score, and health behaviors. Further adjustments for socioeconomic position did not change the result substantially. Additional analyses showed that a one-standard deviation increase on the influence scale resulted in a 27% decreased risk of severe depressive symptoms. Among men, job insecurity predicted severe depressive symptoms (RR = 2.04, 95% CI: 1.02, 4.07). The findings indicate that the work environment influences the risk of developing severe depressive symptoms and that different factors play a role for men and women.

anxiety; depression; longitudinal studies; mental health; social support; stress, psychological; workplace

Abbreviations: CI, confidence interval; DWECS, Danish Work Environment Cohort Study; MHI-5, five-item Mental Health Inventory of the 36-item Short-Form Health Survey; RR, relative risk.

Editor’s note: An invited commentary on this article appears on page 888, and the author’s response appears on page 891.

Depression is a major burden of disease and includes such diagnoses as unipolar (major) depression, dysthymia, or depressive episodes, according to the fourth edition of the Diagnostic and Statistical Manual of Mental Health Disorders (1) and the International Classification of Diseases, Tenth Revision (2). The World Health Organization reports that the point prevalence for unipolar depression is 3.2 percent for women and 1.9 percent for men, with a 12-month prevalence of 9.5 percent for women and 5.8 percent for men (3). Unipolar depression is the fourth leading cause of “disability-adjusted life years” (3, 4) and the leading cause for “years of life lived with disability” in men and women in the world (3).

Depression is not only adverse in itself but also triggers severe negative consequences. On the societal level, depression contributes to long-term sickness absence and early retirement (5, 6). On the individual level, depression might lead to life-threatening diseases. Two recent meta-analyses
found that depression was an independent risk factor for myocardial infarction and death due to coronary heart disease in initially healthy people (7, 8).

Numerous studies have investigated whether psychosocial work characteristics are associated with a higher probability of major depression and depressive symptoms; for an overview, refer to the article by Tennant entitled, “Work-related Stress and Depressive Disorders” (9). However, most of these studies are cross-sectional in design and therefore do not allow causal inference. Only a few studies have utilized prospective data so far. Using components of the “demand-control-support model,” that is, high psychological demands, low decision authority, and low social support at work (10, 11), in a French cohort with 11,552 employees of an electricity and gas company, Niedhammer et al. (12) found that these components predicted the onset of depression over a 12-month follow-up. Stansfeld et al. (13) found, in a 5-year follow-up with 10,308 British civil servants, that demands, control, and support, as well as a high effort-reward imbalance (14), predicted the incidence of minor psychiatric disorders (which were identified as mainly depressive symptoms) in men and women. Although these and other studies with selected occupational groups provide insight into the association between the psychosocial work environment and depression, to our knowledge, no prospective study has yet been conducted that investigated this association in the general working population. This paper aims to fill this void by analyzing the impact of psychosocial work characteristics on the incidence of severe depressive symptoms in a 5-year prospective study with a representative sample of the Danish workforce.

MATERIALS AND METHODS

Study sample

The analyses are based on data from the Danish Work Environment Cohort Study (DW ECS). In 1990, a random sample of 9,653 Danish residents was drawn from the Central Population Register of Denmark and interviewed by phone on various aspects of work and health, including the application of standardized scales on psychosocial work characteristics. In 1995 and 2000, the same people were contacted again, and new participants additionally supplemented the cohort. A more detailed description of DW ECS has been published elsewhere (15).

Depressive symptoms were measured in 1995 and 2000 but not in the 1990 survey. Therefore, analyses in this paper are based on baseline variables in 1995 and the incidence of severe depressive symptoms in 2000. In 1995, 10,702 Danish residents were approached to participate in DW ECS. Of these, 8,583 participated in the survey (response rate: 80 percent). Among the respondents, 5,423 were employed at the time of the survey and therefore eligible for the study. Of these, 11 emigrated or died during the follow-up period, and 942 did not respond to the follow-up questionnaire, yielding a follow-up sample of 4,470 (response rate: 83 percent; estimated combined response rate: 0.80 × 0.83 = 66 percent). For the purpose of the analyses in this paper, we further excluded 233 participants with missing values on the variables of interest and 104 participants who had shown severe depressive symptoms in 1995, resulting in a final study sample of 4,133 participants (figure 1).

Measurement of severe depressive symptoms

Severe depressive symptoms at baseline and at follow-up were assessed with the Danish version of the five-item Mental Health Inventory (MHI-5) of the 36-item Short-Form Health Survey (16–19). Although the scale is meant to measure mental health in general, a review of the literature showed that the instrument seems to be most appropriate for measuring severe depressive symptoms (16, 20–22).

The MHI-5 consists of five items on the frequency of depressive symptoms in the past 4 weeks. A complete list of the items is provided in the Appendix. Scores were summed up and standardized, yielding a scale with scores ranging from 0 to 100, with higher scores indicating fewer depressive symptoms. In accordance with studies from others (20, 23), we classified participants scoring 52 points or less as cases of severe depressive symptoms.

Measurement of psychosocial work characteristics

We measured six psychosocial work characteristics: quantitative demands, influence at work, possibilities for development, social support from supervisors, social support from coworkers, and job insecurity. All six factors are well recognized as important psychosocial exposures at work and have been used in several other studies (9, 12, 13, 24–28). However, at the time of the baseline assessment, no reliable Danish instrument measuring these factors existed, and therefore the items and the scales for this study were constructed by a research group at the National Institute of Occupational Health in Denmark (15).

The items and response categories of the psychosocial work characteristics are provided in the Appendix. Influence at work and possibilities for development were measured with scales consisting of three items each. The scales were built by summing up the numerical values of the response options, with higher values indicating higher influence and higher possibilities for development, respectively. Respondents scoring below the median on the two scales were categorized as exposed to low influence and low possibilities for development, respectively.

Quantitative demands, social support from supervisors, and social support from coworkers were measured with single items. We asked participants if the amount of their work is so extensive that they do not have time to think and talk about anything else than work. Participants who answered that this is true for at least half of the working hours were categorized as having high quantitative demands. Regarding social support, participants were asked if they receive “support and encouragement” from their supervisors and from their coworkers. Respondents who answered “usually not,” “never,” or “I do not have a supervisor”/“I do not have coworkers” were categorized as exposed to low supervisor support and low coworker support, respectively.

Job insecurity was measured with four dichotomous (yes/ no) items asking the participants if they were worried about
any of the following situations: 1) becoming unemployed; 2) being transferred to another job against their will; 3) becoming redundant as a result of new technology; and 4) having difficulty in finding another job if they became unemployed. Respondents who answered “yes” to at least one of the four items were categorized as exposed to job insecurity.

Measurement of covariates

We recorded the covariates age, gender, cohabitation, number of children living at home, highest level of school education, change in employment status, health behaviors, and socioeconomic position. We included these variables, because other studies have found them to be related with psychosocial work characteristics, mental health, or both (29–35).

We combined cohabitation and children living at home into the variable “family status,” with the following categories: 1) cohabiting with child; 2) cohabiting without child; 3) single with child; and 4) single without child. The highest level of school education was categorized in accordance with the Danish educational system, yielding three groups: 1) left school without completing the 10-year examination; 2) completed the 10-year examination; and 3) earned advanced education. The variable “change in employment status” indicated if a respondent had experienced any of the following circumstances: 1) had been at the same workplace between baseline and the follow-up survey; 2) had changed workplaces during this period; or 3) was no longer employed at follow-up.

Health behaviors included smoking, alcohol consumption, and leisure-time physical activity. Whereas smoking was assessed in the 1995 baseline survey, alcohol consumption and leisure-time physical activity had to be derived from the 2000 follow-up survey. Smoking was dichotomized as current “smokers” and “nonsmokers.” Alcohol consumption was categorized by three groups: 1) no consumption of alcohol, 2) moderate consumption, and 3) heavy consumption, with “heavy consumption” defined as drinking more than two and three units per day, respectively, for women and men. A “unit” was defined as one small bottle of beer (0.33 liter), one glass of wine, or one shot of liquor. With four response categories corresponding to sedentary, light, moderate, and strenuous physical activity, leisure-time physical activity was assessed with the question, “When you should describe your leisure-time physical activity in the last year, including commuting to or from work, to what group do you belong?”

Socioeconomic position was defined by employment grade, job title, and education, yielding five categories: I (executives and/or academics); II (middle managers and/or having more than 3–4 years of further education); III (other white collar workers); IV (skilled blue collar workers); and V (semi- or unskilled blue collar workers).

Statistical analysis

All analyses were conducted with the STATA, version 7.0, statistical program package (Stata Corporation, College Station, Texas). Internal consistency of the depression scale and the work environment scales was estimated with Cronbach’s alpha. Correlations between depression scores at baseline and follow-up were calculated with Pearson’s correlation coefficients.

Using the six categorical psychosocial workplace characteristics as predictors and the incidence of severe depressive symptoms as the outcome, we calculated gender-stratified relative risks and 95 percent confidence intervals with multivariate logistic regression models. In addition, we used the two scales on influence at work and possibilities for development as continuous variables to assess the relative risk for severe depressive symptoms for each one-standard deviation change of the scales. Covariates were included in three different models. Model 1 was adjusted for age, family status, school education, change in employment status, and depression score at baseline. Model 2 was additionally adjusted for health behaviors, that is, smoking, alcohol consumption, and leisure-time physical activity. Model 3 was further adjusted for socioeconomic position. In an additional analysis, we repeated model 2 for a study sample of 4,237 participants that also included the 104 persons with severe depressive symptoms at baseline.

RESULTS

Figure 1 gives an illustration of the exclusion process and shows the percentage of participants with severe depressive symptoms in 1995 and 2000 at each step. The percentages of cases decreased throughout the exclusion process. Caseness of severe depressive symptoms in 2000 was found among 3.9 percent of the 8,583 responders to the 1995 baseline survey but only among 2.5 percent of the 4,133 persons in the final study sample. This reduction was caused mainly by excluding persons who were not employees in 1995. For example, among the 3,160 nonemployees in 1995, caseness of severe depressive symptoms was 8.1 percent in 1995 and 5.7 percent in 2000. The highest prevalence rates with 10.4 percent in 1995 and 7.1 percent in 2000 were found among the 2,348 persons who were out of the labor market (not shown in the figure).

The mean age of the sample was 39 years with a standard deviation of 11 years. Slightly more than one fourth had an advanced school education, and the majority worked as white collar workers (table 1). Depression scores in 1995 and in 2000 were positively correlated with a correlation coefficient of 0.31 ($p < 0.001$). The mean score on the depression scale at follow-up was 87.06 with a standard deviation of 12.37. The score was not normally distributed but heavily skewed to the right (i.e., in the direction of fewer depressive symptoms), with 84 percent of the participants scoring 80 points or more. There were 105 participants (68 women and 37 men) with severe depressive symptoms at follow-up, yielding an incidence rate of 2.5 (3.4 for women and 1.7 for men).

Cronbach’s alpha values for the influence at work and the possibilities for development scales were 0.53 and 0.64, respectively. Cronbach’s alpha for the depression scales was 0.78 in 1995 and 0.81 in 2000.
Table 2 shows the relative risks for severe depressive symptoms for psychosocial work characteristics among women. Low influence at work (relative risk (RR) = 2.17, 95 percent confidence interval (CI): 1.23, 3.82) and low social support from supervisors (RR = 2.03, 95 percent CI: 1.20, 3.43) were predictive for the onset of severe depressive symptoms, when adjusted for sociodemographic factors, health behaviors, and depression score at baseline (model 2). When socioeconomic position was added (model 3), effect estimates decreased somewhat more but remained substantial (for low influence: RR = 1.96, 95 percent CI: 1.10, 3.47; for low supervisor support: RR = 1.92, 95 percent CI: 1.13, 3.26). There were no effects for quantitative demands, possibilities for development, social support from coworkers, and job insecurity.

When we analyzed influence at work and possibilities for development as continuous variables (data not shown in table), we found a dose-response relation between increasing...
influence at work and decreasing risk of developing severe depressive symptoms. After adjustment for the covariates from model 2, a one-standard deviation increase on the influence at work scale resulted in a 27 percent decreased risk of severe depressive symptoms (RR = 0.73, 95 percent CI: 0.59, 0.91; p = 0.006). Additional adjustment for socioeconomic position resulted in a relative risk of 0.80 (95 percent CI: 0.63, 1.01; p = 0.06). For possibilities for development, no statistically significant effect was found.

Table 3 shows the relative risks of severe depressive symptoms for psychosocial work characteristics among men. Job insecurity was predictive in all three models (model 2: RR = 2.04, 95 percent CI: 1.02, 4.07; model 3: RR = 2.09, 95 percent CI: 1.04, 4.20). No statistically significant associations were found for quantitative demands, influence at work, possibilities for development, and social support from supervisors and from coworkers. Influence at work and possibilities for development as continuous variables were also unrelated to the risk of severe depressive symptoms (data not shown in table).

Repeating the analyses of model 2 for a study sample also including persons with severe depressive symptoms at baseline did not change the effect estimates substantially for most variables. Changes of relative risks of 10 percent or more were observed among women for influence at work (from 2.17 to 2.41 when cases at baseline were included) and possibilities for development (from 1.11 to 1.30) and among men for supervisor support (from 1.17 to 1.46) and coworker support (from 1.29 to 1.45).

**DISCUSSION**

Psychosocial work characteristics were prospectively associated with the development of severe depressive symptoms in this representative sample of the Danish workforce. Among women, low influence at work and low social support from supervisors resulted in a twofold increased risk. Moreover, low influence at work showed a dose-response relation with risk of severe depressive symptoms. These results are in line with other prospective studies that found low control at work and low social support predictive for depression, psychiatric disorders, and psychological distress (12, 13, 28).

Among men, the association between psychosocial work characteristics and severe depressive symptoms was remarkably different. Neither influence at work nor social support from supervisors was associated with severe depressive symptoms. Job insecurity, on the other hand, was predictive, which is in line with findings from Ferrie et al. (36) that job insecurity is a risk factor for minor psychiatric disorders and depression. However, Ferrie et al. found job insecurity to be predictive in both men and women, whereas in our study the effect of job insecurity was restricted to men.

The different patterns of association between psychosocial work characteristics and severe depressive symptoms for men and women in our study underline the importance of conducting gender-stratified analyses when studying depression. Whether these gender differences may be partly explained by differences in the structure of the occupations and thus different work characteristics for men and women (37) or by differences in the perception of or vulnerability to work conditions (38) or whether they emerge because of a different time course of psychosocial work characteristics in the onset of depressive symptoms cannot yet be determined. Certainly, these gender differences merit further exploration.

**Strengths of the study**

To our knowledge, this is the first time that prospective analyses on the impact of psychosocial work characteristics on severe depressive symptoms were conducted in a representative sample of the general working population. The prospective nature of the study allows causal inference, and the use of the representative sample allows generalizing the findings for the Danish workforce.

In the analyses, we excluded persons with severe depressive symptoms at baseline and also adjusted for baseline...
depression score to reduce the possibility that depressive symptoms affected the perception of psychosocial work characteristics. We further adjusted for other potential confounders, including family status, health behaviors (model 2), and socioeconomic position (model 3). A priori, we viewed model 2 as the most appropriate model. As shown in Materials and Methods, socioeconomic position was based mainly on occupational status. It has been argued that low occupational status increases the likelihood of exposure to adverse psychosocial work characteristics, which then increases the risk of disease (39–42). Consequently, researchers in the field of work and health have pointed out that controlling for occupational status when analyzing associations between psychosocial work characteristics and health outcomes could cause overadjustment (43, 44). We find this argument convincing and therefore believe that the analysis in model 2 is the most appropriate. However, we also showed the findings for model 3 in order to address recent criticism that associations between psychosocial work characteristics and health outcomes are confounded by more favorable psychosocial exposure patterns among people of higher socioeconomic position (45–47).

Limitations of the study

A limitation of this study is that severe depressive symptoms were not assessed with the “gold standard,” a diagnostic interview, but with a questionnaire. This questionnaire, the MHI-5, was developed to measure mental health and has been used as a measurement of both mental health in general and depression. After a review of the literature, we concluded that the MHI-5 is an acceptable instrument to measure severe depressive symptoms. Rumpf et al. (21) validated the MHI-5 against clinical diagnoses with a diagnostic interview and found that the sensitivity and specificity of the MHI-5 were most satisfactory for mood disorders (which includes major depression and dysthymia), with an area under the receiver operating characteristics curve of 0.88. Anxiety disorders, somatoform disorders, and substance use disorders had considerably lower receiver operating characteristics curves of 0.71, 0.65, and 0.65, respectively. Strand et al. (20) and Berwick et al. (16) compared the MHI-5 with several other diagnostic instruments, and both concluded that the MHI-5 is a valid instrument to measure depressive disorders.

TABLE 2. Impact of psychosocial work characteristics on the incidence of severe depressive symptoms in 2,004 employed women, Danish National Work Environment Cohort Study, 1995–2000

<table>
<thead>
<tr>
<th>Psychosocial work characteristics</th>
<th>Exposed (no.)</th>
<th>Incident severe depressive symptoms</th>
<th>Model 1*</th>
<th>Model 2†</th>
<th>Model 3‡</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No.</td>
<td>%</td>
<td>Relative risk</td>
<td>95% confidence interval</td>
</tr>
<tr>
<td>Quantitative demands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low§</td>
<td>1,402</td>
<td>48</td>
<td>3.42</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>602</td>
<td>20</td>
<td>3.32</td>
<td>0.80</td>
<td>0.46, 1.39</td>
</tr>
<tr>
<td>Influence at work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High§</td>
<td>947</td>
<td>18</td>
<td>1.90</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>1,057</td>
<td>50</td>
<td>4.73</td>
<td>2.23</td>
<td>1.27, 3.92</td>
</tr>
<tr>
<td>Possibilities for development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High§</td>
<td>961</td>
<td>28</td>
<td>2.91</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>1,043</td>
<td>40</td>
<td>3.84</td>
<td>1.14</td>
<td>0.68, 1.91</td>
</tr>
<tr>
<td>Social support from supervisor</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>High§</td>
<td>1,611</td>
<td>43</td>
<td>2.67</td>
<td>1.00</td>
<td></td>
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<tr>
<td>Low</td>
<td>393</td>
<td>25</td>
<td>6.36</td>
<td>2.05</td>
<td>1.22, 3.46</td>
</tr>
<tr>
<td>Social support from coworkers</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High§</td>
<td>1,803</td>
<td>59</td>
<td>3.27</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>201</td>
<td>9</td>
<td>4.48</td>
<td>1.07</td>
<td>0.51, 2.25</td>
</tr>
<tr>
<td>Job insecurity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No§</td>
<td>1,129</td>
<td>33</td>
<td>2.92</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>875</td>
<td>35</td>
<td>4.00</td>
<td>1.21</td>
<td>0.73, 1.99</td>
</tr>
</tbody>
</table>

* Model 1 was adjusted for age (continuous), family status (cohabiting and having children), school education, change in employment status during follow-up, and depression score at baseline (continuous).
† Model 2 was adjusted for all the variables in model 1 plus smoking (at baseline), alcohol consumption (at follow-up), and leisure-time physical activity (at follow-up).
‡ Model 3 was adjusted for all the variables in model 2 plus socioeconomic position.
§ Referent.
On the basis of these findings, we are confident that the MHI-5 is an acceptable instrument to identify persons with severe depressive symptoms. However, the literature on the MHI-5 does not provide cutoff points for identifying mild and moderate depressive symptoms, and we therefore did not conduct analyses of these less severe, albeit important, forms of depressive disorders. Furthermore, it has to be noted that the MHI-5 scale covers exclusively affective symptoms and mood but not disturbance in daily function, which is an important criterion in assessing depression in psychiatric interviews. Consequently, we did not use the terms “clinical depression,” “unipolar depression,” or “major depression” for caseness in our study but used the more general term “severe depressive symptoms.”

We examined the relation between psychosocial work characteristics and the onset of severe depressive symptoms by use of a 5-year follow-up period. It should be taken into account that, within the follow-up period, changes may have occurred in both exposure and outcome variables. With regard to the exposure measures, this would mean that, for some participants, psychosocial work characteristics measured at baseline would differ from the exposure during some phases of the follow-up period. This would be a nondifferential misclassification in the measurement of the exposure variable, which would result in a potential underestimation of the effect sizes. With regard to the outcome variable, it is possible that some participants developed severe depressive symptoms after the 1995 baseline survey but were no longer cases when we conducted the follow-up survey in 2000.

It has further to be noted that we had a relatively low number of incident cases. Consequently, some of the confidence intervals were wide, especially among men, increasing the probability of a type II error (i.e., we might have failed to detect an effect for some exposure variables because of lack of statistical power). For example, high quantitative demands among men showed a relative risk of 0.48, indicating an unexpected protective effect, which might have been statistically significant if the numbers of cases would have been higher.

Similar to most research on working conditions and health, our study is prone to selection bias because of the healthy worker effect (48). As shown in figure 1, people out of the labor market were at higher risk for severe depressive symptoms. Although it is reasonable to assume that a certain

### TABLE 3. Impact of psychosocial work characteristics on the incidence of severe depressive symptoms in 2,129 employed men, Danish National Work Environment Cohort Study, 1995–2000

<table>
<thead>
<tr>
<th>Psychosocial work characteristics</th>
<th>Exposed (no.)</th>
<th>Incident severe depressive symptoms</th>
<th>Model 1*</th>
<th>Model 2†</th>
<th>Model 3‡</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No. %</td>
<td>Relative risk</td>
<td>95% confidence interval</td>
<td>Relative risk</td>
</tr>
<tr>
<td>Quantitative demands</td>
<td></td>
<td>Low §</td>
<td>1,628 31 1.90 1.00 1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>501 6 1.20 0.47 0.18, 1.19</td>
<td>0.46</td>
<td>0.18, 1.19</td>
</tr>
<tr>
<td>Influence at work</td>
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<td>High§</td>
<td>1,074 19 1.77 1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>1,055 18 1.71 0.61 0.30, 1.23</td>
<td>0.60</td>
<td>0.30, 1.22</td>
</tr>
<tr>
<td>Possibilities for development</td>
<td></td>
<td>High§</td>
<td>1,136 15 1.32 1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>993 22 2.22 1.18 0.58, 2.39</td>
<td>1.16</td>
<td>0.57, 2.37</td>
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<tr>
<td>Social support from supervisor</td>
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<td>1,519 22 1.45 1.00</td>
<td>1.00</td>
<td>1.00</td>
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<td></td>
<td></td>
<td>Low</td>
<td>610 15 2.46 1.20 0.60, 2.40</td>
<td>1.17</td>
<td>0.58, 2.35</td>
</tr>
<tr>
<td>Social support from coworkers</td>
<td></td>
<td>High§</td>
<td>1,803 27 1.50 1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>326 10 3.07 1.33 0.61, 2.92</td>
<td>1.29</td>
<td>0.59, 2.84</td>
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<tr>
<td>Job insecurity</td>
<td></td>
<td>No §</td>
<td>1,331 15 1.13 1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>798 22 2.76 2.04 1.02, 4.06</td>
<td>2.04</td>
<td>1.02, 4.07</td>
</tr>
</tbody>
</table>

* Model 1 was adjusted for age (continuous), family status (cohabiting and having children), school education, change in employment status during follow-up, and depression score at baseline (continuous).
† Model 2 was adjusted for all the variables in model 1 plus smoking (at baseline), alcohol consumption (at follow-up), and leisure-time physical activity (at follow-up).
‡ Model 3 was adjusted for all the variables in model 2 plus socioeconomic position.
§ Referent.
proportion of these cases were not participating in the workforce because of depression, another proportion of these cases might have developed depression and left the workforce because of previous exposure to adverse psychosocial work characteristics.

Two covariates, alcohol consumption and leisure-time physical activity, were not measured at baseline but at follow-up only. By including these variables in the analyses, we might have biased the results toward the null hypothesis, because alcohol consumption and leisure-time physical activity measured in 2000 might have been influenced by the development of severe depressive symptoms during follow-up. We were aware of this possible bias; however, we believed it would be more important to address the potential confounding effects of these two important health-related behaviors and therefore included them in the analyses.

Studies analyzing the associations between self-reported exposure to psychosocial work characteristics and self-reported measures of health are generally prone to what has been called “bias due to common method” or “triviality trap” (24, 49, 50). This means that statistical associations between exposure and outcome might be the result of poor health’s causing a more negative view of the work environment or of a general negative response style that includes the self-assessment of both work environment and health. In this study, however, we controlled for this bias, by adjusting for baseline depression scores in the analyses.

Finally, our study is limited with regard to the inclusiveness of the constructs we used to measure the psychosocial work environment. Although we used well-established constructs, recent research indicates that a more comprehensive assessment of the psychosocial work environment is needed. There is accumulating evidence that the imbalance between high efforts and low reward at work increases the risk of ill health, including mental health disorders (14, 51, 52). It has further been argued that concepts such as “meaning of work” and “predictability of work” can contribute to a better understanding of the psychosocial work environment (53, 54). There is also an ongoing debate on the need for an expansion of the psychological demands concept, including a differentiation in quantitative, cognitive, sensorial, and emotional demands (55, 56) and a distinction between intensive (high work pace) and extensive (long working hours) quantitative demands (57). Most of these new developments and discussions emerged after the 1995 survey of DWECs. Fortunately, we were able to address several of these issues in the 2000 survey by including substantially expanded and revised psychosocial work environment measurements (15). When new follow-up data on depressive symptoms are available from the DWECs 2005 survey, we will be able to conduct analyses with a more comprehensive assessment of the psychosocial work environment.

Conclusion

We conclude that psychosocial work characteristics contribute to the development of severe depressive symptoms in the Danish workforce. Different aspects of the psychosocial work environment seem to be important for men and women. Reviews indicate that intervention strategies to improve the psychosocial work environment are available and effective (58–60). Hence, improving the psychosocial work environment might be an important tool for reducing severe depressive symptoms.

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Severe depressive symptoms

Questions include the following: 1. How much of the time during the past 4 weeks have you been a very nervous person? 2. How much of the time during the past 4 weeks have you been a very nervous person? 3. How much of the time during the past 4 weeks have you felt downhearted and blue? 4. How much of the time during the past 4 weeks have you felt calm and peaceful? 5. How much of the time during the past 4 weeks have you felt so down in the dumps that nothing could cheer you up? 6. How much of the time during the past 4 weeks have you been a very nervous person? (1 = almost all working hours; 2 = 3/4 of working hours; 3 = 1/2 of working hours; 4 = 1/4 of working hours; 5 = seldom; 6 = never).

Scoring. Participants scoring 1, 2, or 3 were coded as having high quantitative demands.

Influence at work

Items and response categories. In your work, is it possible for you to decide your work pace? (1 = almost all working hours; 2 = 3/4 of working hours; 3 = 1/2 of working hours; 4 = 1/4 of working hours; 5 = seldom; 6 = never). Are you involved in planning your work? (1 = always; 2 = usually; 3 = usually not; 4 = never). Do you receive information on those decisions that affect your workplace? (1 = always; 2 = usually; 3 = usually not; 4 = never).

Scoring. Response categories were recoded and summed up to build a scale on influence at work. Scores on the scale were standardized from 0 to 100, with higher scores indicating more influence at work. Participants scoring below the median on the scale were coded as having low influence at work.

Possibilities for development

Items and response categories. Does your work require that you repeat the same work tasks many times per hour? (1 = almost all working hours; 2 = 3/4 of working hours; 3 = 1/2 of working hours; 4 = 1/4 of working hours; 5 = seldom; 6 = never). Do you have the possibility to learn new things and to qualify yourself at work? (1 = always; 2 = usually; 3 = usually not; 4 = never). Is your work varied? (1 = to a large extent; 2 = to some extent; 3 = only to a less extent; 4 = no, or only to a small extent).

Scoring. Response categories were recoded and summed up to build a scale on possibilities for development. Scores on the scale were standardized from 0 to 100, with higher scores indicating more possibilities for development. Participants scoring below the median on the scale were coded as having low possibilities for development.

Social support from supervisors

Item and response categories. Do you receive support and encouragement from your supervisor? (1 = always; 2 = usually; 3 = usually not; 4 = never; 5 = do not have a supervisor).

Scoring. Participants scoring 3, 4, or 5 were coded as having low supervisor support.

Social support from coworkers

Item and response categories. Do you receive support and encouragement from your coworkers? (1 = always; 2 = usually; 3 = usually not; 4 = never; 5 = do not have coworkers).

APPENDIX

This appendix describes how the endpoint variable (severe depressive symptoms) and the six predictor variables (quantitative demands, influence at work, possibilities for development, social support from supervisors, social support from coworkers, job insecurity) were measured in the survey companion and how scores were calculated.

Severe depressive symptoms

Items and response categories. How much of the time during the past 4 weeks have you been a very nervous person? How much of the time during the past 4 weeks have you felt downhearted and blue? How much of the time during the past 4 weeks have you felt calm and peaceful? How much of the time during the past 4 weeks have you felt so down in the dumps that nothing could cheer you up? How much of the time during the past 4 weeks have you been a very nervous person? (1 = almost all working hours; 2 = 3/4 of working hours; 3 = 1/2 of working hours; 4 = 1/4 of working hours; 5 = seldom; 6 = never).

Scoring. Response categories were recoded and summed up to build a scale on depressive mood. Scores on the scale were standardized from 0 to 100, with higher scores indicating less depressive symptoms. Participants scoring 52 points or below on the scale were coded as having severe depressive symptoms.
**Scoring.** Participants scoring 3, 4, or 5 were coded as having low coworker support.

**Job insecurity**

**Items and response categories.** Are you worried about any of the following outcomes: becoming unemployed; being transferred to another job against your will; becoming redundant because of new technology; having difficulty in securing another job if you became unemployed? (1 = yes; 2 = no).

**Scoring.** Participants responding “yes” to at least one item were scored as having job insecurity.