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Externally assessed psychosocial work characteristics and diagnoses of anxiety and depression

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ABSTRACT

Background: Interpretations of relationships between work characteristics and psychiatric disorders may be biased by over-reporting of unfavourable work characteristics among those with psychiatric disorders. This study attempts to account for this bias by using external assessments of work characteristics.

Methods: Psychiatric symptoms were assessed in an interview and psychiatric diagnoses were established according to DSM-IV. Current work characteristics and work characteristics three years ago were assessed in an interview with predetermined criteria and included cognitive requirements, possibility of influence, and required conformance to schedule, time pressure, and hindrances concerning goals, resources and instrumental support. Deterioration in work characteristics during the study period was also assessed. The sample consisted of 672 employed men and women in different occupations.

Results: Lack of instrumental support from colleagues and supervisors (OR 6.4, 95% CI 2.6 to 15.8) assessed as a hindrance to work performance, and deterioration in work characteristics during the study period (OR 2.8, 95% CI 1.3 to 6.1) were associated with increased odds ratios for depression after adjustment for confounding factors, including symptoms of mental illness at baseline. Findings for anxiety were similar but not statistically significant.

Conclusion: Externally assessed lack of instrumental social support at work and deteriorating work characteristics were associated with an increased risk for depression.

In studies of the relationship between work characteristics and psychiatric disorders several important problems need to be addressed. These include the fact that unfavourable work characteristics may contribute to certain psychiatric disorders and also that the reverse is true—psychiatric disorders may lead to unfavourable work characteristics. Additionally, people with mental illness may over-report unfavourable work characteristics. The vast majority of the studies performed so far have not been able to address any of these problems because they were cross-sectional and did not use any form of external assessment of exposure.

However, there are a number of cross-sectional studies with longitudinal follow-up singularly based on questionnaires which provide information on the causal paths from exposure to outcome.^{1–9}

Only a few studies have investigated the relation between work characteristics and psychiatric

diagnoses. Psychiatric diagnoses are clusters of symptoms that commonly occur together, which often have severe social- and health-related consequences and which are internationally comparable. Thus they have several advantages compared to questionnaire-assessed psychological distress. Most of the studies on associations between work characteristics and psychiatric disorders have also been cross-sectional, although these have sometimes been based on a case-referent selection of subjects.^{10–14}

A prospective design will increase the possibility of being able to draw conclusions about causal relationships; however there are only a few longitudinal studies on the relation between work characteristics and psychiatric diagnoses. In a study by Bromet and colleagues it was found that high work demands, especially in combination with lack of social support at work, increased the risk of an outcome which combined diagnoses of anxiety and depression.¹⁵ In another study Kawakami and colleagues¹⁶ found that an imbalance between work demands and workers' own skills was strongly related to depression and that unsatisfactory relations with supervisors and co-workers were possibly associated with an increased risk of depression. Both these studies included only men. Ylipaavalniemi and colleagues found among hospital employees that poor team climate and organisational justice were associated with a higher risk of depression, but that job control, job demands and job strain did not predict depression over two years.¹⁷ A population-based study by Wang¹⁸ found that psychological demands, low skill use, lack of support and insecure employment were longitudinally related to depression. Recently Wang concluded that a composite measure of work stress is an independent risk factor for the development of major depressive episodes in the working population.¹⁹

In order to avoid over-reporting of unfavourable work characteristics among those with psychiatric disorders it is preferable to use methods that aim to distinguish the actual conditions from the individual emotional response to them. The LEDS (Life Events and Difficulties Schedule) that was developed by Brown and Harris²⁰ is an attempt to this end. It was used in a study by Weinberg and Creed,¹⁴ but does not cover the most well known models for work environment-disorder relationships, like the demand-control or the demand-control-support models.²¹ The work characteristics in our study are in approximate accordance with

the demand-control-support model and based on the tradition of action regulation theory.²² The measures used in this study to assess work characteristics reflect an external perspective (that is, as obtained by interviewers) using predefined criteria for each dimension and one frame of reference for all studied individuals' work.

Aim

The aim of the study was to investigate if psychosocial work characteristics were related to diagnoses of depression and anxiety in a study where psychiatric diagnoses were obtained in a face-to-face interview and where work characteristics were externally assessed. Data on exposure and outcome were collected simultaneously but we were able to adjust the results for symptoms of mental illness at baseline.

METHODS

The PART study

The present study was performed within the PART study (PART is an acronym derived from the Swedish name for psychiatric disorders, work and relations). An initial data collection took place in 1998–2000 when a questionnaire was sent to 19 742 individuals randomly selected from the population in Stockholm County, 20–64 years of age. The questionnaire contained questions on potential risk indicators for psychiatric disorder as well as scales to measure well-being, depression and anxiety. The response rate was 53%; 10 441 responded. An analysis of the effects of non-response in the first phase was made based on register data available for participants as well as non-participants. This analysis showed that male sex, young age, low income, low education, living alone, having immigrated from non-Nordic countries as well as previous admissions to hospital due to psychiatric diagnoses were associated with lower participation rates. However, the associations between potential determinants of psychiatric disorder and the psychiatric disorders were remarkably similar among participants and the entire study population.²³

We sent a new questionnaire in 2001–3 to the respondents with basically the same questions as in the first questionnaire. This time 84% responded which corresponded to 8613 individuals. The attrition in the second phase was associated with the same conditions as in the first phase (Bergman *et al.* Unpublished data).

Subject selection

In conjunction with our second questionnaire participants were selected for an interview. A total of 444 individuals were selected because of low well-being, defined as ≤ 10 points in the World Health Organization's (Ten) Well-being Index, and 437 were selected because of high well-being defined as > 10 points in the same index. In the first phase of this study we found that this limit was associated with an increased risk of psychiatric disorder.²⁴ Among the 881 subjects participating in the interview those 672 (431 women and 241 men) who were employed or self-employed at the time of the interview and had been employed or self-employed for more than two years before the interview were used in the analysis.

Interviews

The interviews were conducted by nine trained interviewers, eight psychologists and one physician.

Work characteristics

The model for externally assessed work characteristics used in this study is work content analysis (ARIA, an acronym derived from the Swedish expression for work content analysis).^{25–26} The procedure of ARIA follows a standardised protocol originally suggested by Volpert and colleagues²⁷ and Leitner and colleagues.²⁸ These protocols are probably the most used theory-guided observational instruments available. Studies using these measures have found associations with several outcomes.²⁹ In comparison to the previous protocols ARIA was modified to be applicable to all kinds of occupations and slightly simplified. The ARIA dimensions intended to capture demand-control conditions have been compared to the same dimensions in the JDC model by factor analysis of replies to the Swedish version of the Job Contents Questionnaire. The results showed that the dimensions of ARIA, on a group level, varied as expected with the self-reported comparable constructs in the JDC model.²⁶

The interviewers were trained to ask the respondents to be concrete and provide examples of situations related to the work characteristic that was to be assessed. The criteria for each category (described below) of the work characteristics determined the assessment.

The participants were asked to describe what skills were needed to execute the work tasks. The components of each work task were classified according to their cognitive requirements. Two types of *imbalance of cognitive requirements* were defined: "High imbalance" implied that the tasks included a high degree of problem solving but very little routine work. "Low imbalance" implied a high degree of routine tasks and a low degree of problem solving. The inter-rater reliability of the method has been tested using other material and has been described elsewhere.³⁰

The *possibility of influencing one's work characteristics* in a long time perspective was considered. To what extent one had influence on which work tasks are included in the work assignment (*what to do*) and to what extent one had influence on how to conduct the tasks (*how to do it*) were assessed. Both these aspects were assessed at three levels.

To what extent the work tasks *required conformance to schedule*—that is, a need to conduct the work tasks in a certain time or space—was assessed.

The quantitative demands in work were described by *time pressure*—that is, whether enough time was provided to conduct the work tasks. If the work tasks could not be unattended for more (or even less) than agreed pauses, and this was not compensated with less hectic periods, the work was considered to entail high time pressure. If the work could be unattended more than 20% of the work time it was assessed as low, else as moderate.

When assessing *hindrances*, the interviewers followed a checklist covering several aspects: hindrances concerning *goals and resources* included unclear goals or work tasks; insufficient resources in terms of equipment, premises and personnel. Lack of instrumental *support from colleagues and supervisors* was defined as a hindrance if it had an effect on the job performance. It did not include the aspect of social climate. The criteria for assessing hindrances were obvious loss of quality of the work result (more than accepted by the supervisor), considerable delay resulting in overtime work, work without breaks, and work executed with an apparent risk of accident or illness.

In order to consider possible negative changes during the study period the subjects were also interviewed regarding *deteriorated work characteristics*. Deteriorated work characteristics were present if the current work (compared to work three years

Table 1 Number (%) of men and women in the study. Frequencies and numbers of all variables included in the analyses among the 672 subjects (431 women and 241 men)

	Men (%)	Women (%)	All (%)
Depression	15 (10)	36 (16)	51 (14)
Anxiety	24 (15)	79 (30)	103 (24)
Cognitive requirements in			
Balance	184 (76)	339 (79)	523 (78)
Low imbalance	27 (11)	40 (9)	67 (10)
High imbalance	30 (12)	52 (12)	82 (12)
Influence on what to do			
Own	46 (19)	57 (13)	103 (15)
Collective	130 (54)	221 (51)	351 (52)
No	64 (27)	152 (35)	216 (32)
Influence on how to do it			
Own	110 (46)	158 (37)	
Collective	111 (46)	211 (49)	322 (48)
No	19 (8)	61 (14)	80 (12)
Required conformance to schedule			
Low	88 (37)	139 (32)	227 (34)
Moderate	109 (45)	211 (49)	320 (48)
High	43 (18)	80 (19)	123 (18)
Time pressure			
Low	80 (33)	98 (23)	178 (27)
Moderate	123 (51)	226 (53)	349 (52)
High	37 (15)	101 (24)	138 (21)
Hindrances goals and resources	67 (28)	114 (34)	211 (32)
Hindrances support from colleagues and supervisors	24 (10)	62 (14)	86 (13)
Deterioration in work characteristics	81 (34)	137 (32)	218 (32)
Financial difficulties	18 (8)	40 (9)	58 (9)
Living alone	55 (26)	152 (39)	207 (31)
Life events (last year s-r)			
0	77 (32)	113 (26)	190 (28)
1–3	141 (59)	260 (61)	401 (60)
>4	21 (9)	56 (13)	77 (12)
Age group			
<34	62 (26)	121 (28)	183 (27)
35–49	103 (43)	166 (39)	269 (40)
>49	76 (32)	144 (33)	220 (33)
Symptoms of mental illness at baseline	67 (28)	169 (40)	236 (36)

Data collection of the variables included in the analysis is described in figure 1.

ago) included any of the following: much less creativity; more routine tasks; much less own influence on work tasks; if the hindrances were considerably increased, if the time pressure or required conformance to schedule had been increased. Deteriorations in each of the working conditions were summed into one variable. Frequencies for the studied dimensions are shown in table 1.

Outcome measures

The outcome measures were *depressive and anxiety syndromes* according to DSM-IV. Symptoms were assessed in a SCAN interview³¹ and diagnoses were made by a psychiatrist (YF). A SCAN interview is often used as the golden standard in the validation of questionnaires on psychiatric symptoms.^{32 33} The interviewers initially took a SCAN course given by a WHO-certified trainer and had regular tutoring during the entire data collection period. DSM-IV diagnostic criteria for Axis I disorders were strictly followed. Additionally diagnoses according to appendix B, criteria sets and axes provided for further study were included.³⁴ The depressive disorders included major depression, dysthymia, mixed anxiety depression and minor depression. Anxiety disorders included agoraphobia, social phobia, specific phobia, panic syndrome with agoraphobia,

panic syndrome and general anxiety syndrome.³⁴ Among the 672 subjects, 51 were diagnosed with depressive disorders and 103 were given anxiety diagnoses. Twenty individuals had concurrent depressive and anxiety diagnoses. Frequencies for the different diagnoses may be found in table 1.

Potential confounders

Six potential confounders were included in the analysis; symptoms of mental illness at baseline, sex, age, self-reported financial difficulties, living alone and negative life events. Except from symptoms of mental illness at baseline they were all obtained from the mailed questionnaire in the second phase of the PART-study. Age was categorised into three groups. *Financial difficulties* were present if the person was not, or probably not, able to raise 1500 € (£1010/\$2015), in a week. *Living alone* was taken into account by comparing those who were living alone to those who were married or had a common-law spouse. *Negative life events* during the last year according to questionnaire, such as severe conflicts (work-related conflict excluded), traumatic accident, or the death of a spouse, were categorised into three levels. Self-reported *symptoms of mental illness* covered symptoms of depression, anxiety and psychological distress stated in the questionnaire in the first data

collection in the PART study were controlled for in the analysis. Depressive symptoms were assessed with a slightly modified version of the Major (ICD-10) Depression Inventory.³⁵ The 20th percentile of the sum of these symptoms (among all respondents) was used as the cut-off point. Symptoms of anxiety included 20 items on bodily senses/inconveniences, five items on phobia and three items on obsession. Symptoms of anxiety were present if any of these three aspects were reported. Psychological distress was defined as ≤ 10 points in the WHO (Ten) Well-being Index. As these three symptom indicators (depression, anxiety, low well-being) were overlapping, our variable for symptoms of mental illness at baseline consisted of any or any combination of these three indicators. Two hundred and thirty six (36%) individuals reported symptoms of anxiety, depression and/or psychological distress, together named symptoms of mental illness at baseline. Frequencies for the potential confounders studied are shown in table 1.

Selection of cases and referents

From the 672 subjects interviewed cases and referents for the analyses of risk factors for depression, or anxiety, were selected as follows: cases were those with a diagnosis of depression, or anxiety, regardless of whether they originated from the group with high or low well-being according to the mailed questionnaire in the second phase of the study. Of the 51 cases of depression five originated from the group with high well-being. Of the 103 cases with anxiety disorders 25 originated from the group with high well-being.

Referents were those with high well-being according to the mailed questionnaire in the second phases of the study and who were not given any psychiatric diagnosis in the interview. There were 322 referents who met these criteria.

All the variables analysed are depicted in figure 1 according to the time when the information was collected

Statistical analysis

Results are reported for men and women together because there were few men with the diagnoses. Sex, however, was always included as an independent variable in the analysis. Logistic regression analyses were performed in four steps. First, analyses of the relation between each independent variable and the outcome were made. Second, multivariate analysis was performed with all work-related variables, which showed a p value

≤ 0.2 in the first step, included. Third, the same work-related variables were included together with the non-work variables, which showed a p value ≤ 0.2 in bivariate analysis. In a fourth step, symptoms of mental illness at baseline were added to the final model. All analyses were performed with the SPSS version 13.0 computer package.

RESULTS

Depression

Hindrances concerning lack of instrumental support from colleagues and supervisors and deterioration in work characteristics during the studied period were related to diagnoses of depression also after adjusting for other potential risk factors outside work, and symptoms of mental illness at baseline (table 2). Financial difficulties, several life events and symptoms of mental illness reported at baseline were also related to depression (table 2). In separate analyses for each sex results were similar but with less precision due to the smaller number of subjects.

Anxiety

Most work characteristics were associated with an increased odds ratio for anxiety in bivariate analysis but did not remain statistically significant when non-work independent variables and symptoms of mental illness at baseline were adjusted for. Symptoms of mental illness at baseline, financial difficulties and being female were significantly related to anxiety in the final model (table 3). When analysis for each sex were conducted the results were similar but with less precision due to the smaller number of subjects.

DISCUSSION

The results of this study indicate that externally assessed psychosocial work characteristics are related to diagnoses of depression. Hindrances in terms of lack of instrumental support from colleagues and supervisors and deterioration in work characteristics during the studied period were associated with significantly increased odds ratios for depression when risk factors outside work and symptoms of mental illness at baseline were considered. Lack of support from colleagues and supervisors was defined as a hindrance to satisfactory job performance, and could be an indicator of inappropriate work organisation. The results may indicate that not only the emotional appraisal of the situation but also how the work is organised is related to diagnoses of depression. Findings for anxiety were similar but not statistically significant

Methodological considerations

The advantages of this study include the extensive symptoms interview summarised in psychiatric diagnoses and the external assessment of work characteristics.

External assessments of exposure through interviews are based on predefined criteria but to some extent also based on the interviewee's subjective appraisal of the work environment. Although external assessments are not necessarily more accurate than incumbent measures, they are more objective in that they are less influenced by the subject's cognitive and emotional processing. Thus, there should be less measurement bias relating to individual psychosocial work characteristics and other psychological and behavioural conditions.^{36 37} A possible over-reporting of inappropriate work characteristics among those with psychiatric disorders is likely to be notably smaller than in self-report questionnaires. Another potential problem

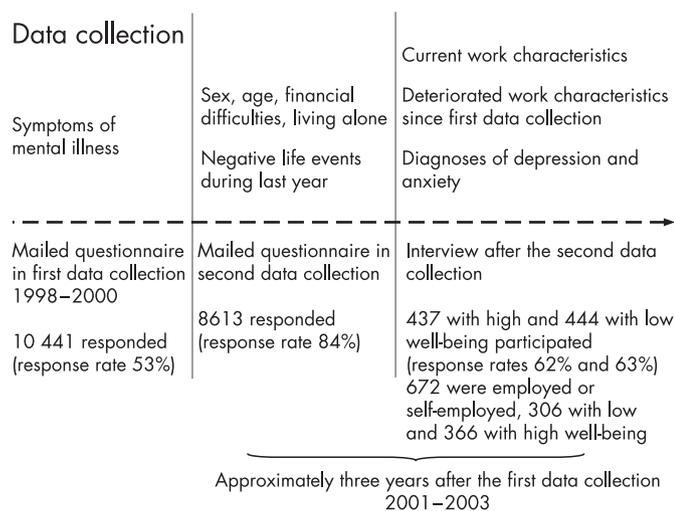


Figure 1 Data collection of the variables included in the analysis.

Table 2 Number of cases of depressive disorders and referents with different work characteristics and potential confounders

	Exposed referents	Exposed cases	Bivariate OR (95% CI)	Multivariate model "work"	Multivariate model "work and life"	Multivariate model "work, life and symptoms at baseline"
Cognitive requirements in						
Balance	260	36	1	1	1	1
Low imbalance	29	5	1.2 (0.5 to 3.4)	0.8 (0.2 to 2.5)	0.5 (0.2 to 2.2)	0.4 (0.1 to 1.7)
High imbalance	33	10	2.2 (1.0 to 4.8)	1.7 (0.7 to 4.3)	1.2 (0.4 to 3.3)	1.2 (0.4 to 3.5)
Influence on what to do						
Own	52	6	1			
Collective	177	28	1.4 (0.5 to 3.5)			
No	92	17	1.6 (0.6 to 4.3)			
Influence on how to do it						
Own	125	18	1	1	1	1
Collective	161	22	0.9 (0.5 to 1.8)	1.0 (0.5 to 2.1)	0.8 (0.4 to 1.7)	1.1 (0.4 to 2.6)
No	35	11	2.2 (0.9 to 5.0)	1.1 (0.4 to 3.0)	1.0 (0.3 to 2.8)	1.2 (0.4 to 3.6)
Required conformance to schedule						
Low	112	13	1	1	1	1
Moderate	162	25	1.3 (0.7 to 2.7)	1.2 (0.5 to 2.6)	1.3 (0.6 to 3.1)	0.9 (0.4 to 2.3)
High	47	13	2.4 (1.0 to 5.5)	1.3 (0.5 to 3.9)	1.5 (0.5 to 4.6)	1.0 (0.3 to 3.5)
Time pressure						
Low	96	7	1	1	1	1
Moderate	170	24	1.9 (0.8 to 4.7)	1.9 (0.7 to 5.0)	1.8 (0.6 to 4.8)	2.0 (0.7 to 5.8)
High	53	20	5.2 (2.1 to 13.0)	3.8 (1.2 to 11.8)	3.3 (1.0 to 10.1)	3.3 (0.9 to 12.4)
Hindrances goals and resources	85	20	1.8 (1.0 to 3.3)	0.8 (0.4 to 1.8)	0.8 (0.4 to 1.7)	0.9 (0.4 to 2.0)
Hindrances support from colleagues and supervisors	23	20	8.3 (4.1 to 16.8)	7.4 (3.2 to 17.0)	7.4 (3.2 to 17.3)	6.4 (2.6 to 15.8)
Deterioration in work characteristics	93	27	2.8 (1.5 to 5.0)	2.8 (1.4 to 5.5)	2.8 (1.4 to 5.7)	2.8 (1.3 to 6.1)
Financial difficulties	12	9	5.5 (2.2 to 13.9)		6.0 (2.0 to 17.9)	5.6 (1.7 to 18.6)
Living alone	80	13	1.2 (0.6 to 2.4)			
Life events (last year s-r)						
0	112	12	1		1	1
1 to 3	192	31	1.5 (0.7 to 3.1)		1.7 (0.7 to 3.9)	1.4 (0.6 to 3.6)
>4	18	7	3.6 (1.3 to 10.4)		5.2 (1.5 to 17.8)	3.7 (1.0 to 14.2)
Age group						
<34	78	11	1			
35 to 49	136	16	0.8 (0.4 to 1.9)			
>49	108	24	1.6 (0.7 to 3.4)			
Female sex	182	36	1.8 (1.0 to 3.5)		1.6 (0.7 to 3.4)	1.3 (0.6 to 3.1)
Symptoms of mental illness at baseline	39	27	8.8 (4.6 to 17)			6.6 (3.0 to 14.7)

Bivariate analysis of the association between each independent variable and the outcome. Multivariate analyses performed in three steps: the first model (work) includes all work characteristics with a p value <0.2 in bivariate analysis; in the second model (work and life), the same work-related variables were included together with the non-work variables which showed a p value <0.2 in bivariate analysis. In the final model (work, life and symptoms at baseline) symptoms of mental illness at baseline were added to the previous model. Odds ratios with 95% CIs are used as the measure of association.

related to the exposure evaluation is that the same interviewers performed the assessment of working conditions as well as the interview for psychiatric symptoms. Thus their information regarding psychiatric symptoms may have affected their exposure evaluation. However, we regard this as less likely due to the predetermined, relatively strict criteria for exposure assessment.

The data on exposure and outcome were collected at the same time which precludes any definite conclusions about directions of causality. However, we were able to adjust the results for symptoms of mental illness at baseline, and also assessed the working conditions at present as well as retrospectively by asking for changes during the last three years—that is, the period between the two data collections. The changes were evaluated comparing three years ago with the present using the same criteria for the different work characteristics. Compared with a conventional cross-sectional study, this procedure decreased the likelihood for reversed causation. Assessing deteriorated work characteristics retrospectively is to some extent more influenced by memory bias than the assessment of current conditions. However, since the interviewees were asked to be concrete and provide

examples of situations that has been added or reduced the subjective elements should have been diminished.

In both phases of the investigation the non-responders to the mailed questionnaires tended to be male, younger, immigrants from non-Nordic countries, with low education and low income. They had also been hospitalised due to psychiatric disorders more often than participants. This selection would seriously bias odds ratios towards the null if, among cases, non-responders compared to responders more often showed potential risk factors and, among referents, non-responders compared to responders less often showed potential risk factors. In order to produce seriously biased odds ratios in the other direction the opposite characteristics would need to be present. Our extensive non-response analyses from phase I²³ as well as phase II (Bergman *et al.* Unpublished data) do, however, not indicate such bias. There did not seem to be any strong selection to our interviews in the second phase. Among those summoned for interview, participants and non-participants in the interview were similar concerning almost all potential risk factors examined among cases as well as referents.

Table 3 Number of cases of anxiety disorders and referents with different work characteristics and potential confounders

	Exposed referents	Exposed cases	Bivariate OR (95% CI)	Multivariate model "work"	Multivariate model "work and life"	Multivariate model "work, life and symptoms at baseline"
Cognitive requirements in						
Balance	260	71	1	1	1	1
Low imbalance	29	15	1.9 (1.0 to 3.7)	1.5 (0.7 to 3.0)	1.6 (0.7 to 3.6)	0.8 (0.3 to 2.2)
High imbalance	33	17	1.9 (1.0 to 3.6)	1.9 (1.0 to 3.7)	1.3 (0.6 to 2.9)	1.2 (0.5 to 2.9)
Influence on what to do						
Own	52	11	1	1	1	1
Collective	177	48	1.3 (0.6 to 2.6)	1.2 (0.5 to 2.7)	1.5 (0.6 to 3.8)	1.6 (0.6 to 4.5)
No	92	44	2.3 (1.1 to 4.8)	1.7 (0.7 to 4.1)	1.7 (0.7 to 4.6)	1.4 (0.5 to 4.3)
Influence on how to do it						
Own	125	34	1	1	1	1
Collective	161	51	1.2 (0.7 to 1.9)	1.2 (0.7 to 2.1)	1.0 (0.6 to 1.8)	1.2 (0.6 to 2.5)
No	92	18	1.9 (1.0 to 3.7)	1.0 (0.4 to 2.4)	1.0 (0.4 to 2.5)	1.4 (0.5 to 3.9)
Required conformance to schedule						
Low	112	36	1			
Moderate	162	47	0.9 (0.5 to 1.5)			
High	47	20	1.3 (0.7 to 2.5)			
Time pressure low						
Moderate	170	52	1.2 (0.7 to 2.05)	1.1 (0.6 to 1.9)	1.3 (0.6 to 2.4)	1.6 (0.8 to 3.4)
High	53	26	1.9 (1.0 to 3.6)	1.5 (0.7 to 2.9)	1.3 (0.6 to 3.0)	1.3 (0.5 to 3.2)
Hindrances goals and resources	85	43	2.0 (1.2 to 3.1)	1.5 (0.9 to 2.6)	1.4 (0.8 to 2.5)	1.6 (0.9 to 3.1)
Hindrances support from colleagues and supervisors	23	19	3.0 (1.5 to 5.7)	2.2 (1.0 to 4.5)	2.2 (0.9 to 5.2)	1.5 (0.6 to 4.0)
Deterioration in work characteristics	93	41	1.6 (1.0 to 2.6)	1.7 (1.0 to 2.7)	1.6 (0.9 to 2.7)	1.5 (0.8 to 2.7)
Financial difficulties	12	17	5.1 (2.3 to 11.1)		6.5 (2.3 to 18.0)	4.9 (1.5 to 15.7)
Living alone	80	38	1.9 (1.2 to 3.1)		1.4 (0.8 to 2.5)	1.3 (0.7 to 2.5)
Life events (last year s to r)					1	1
0	112	20	1		1.3 (0.7 to 2.5)	1.0 (0.5 to 1.9)
1 to 3	192	63	1.8 (1.1 to 3.2)		2.9 (1.1 to 7.5)	1.3 (0.4 to 4.0)
>4	18	18	5.6 (2.5 to 12.6)			
Age group						
<34	78	27	1			
35 to 49	136	43	0.9 (0.5 to 1.6)			
>49	108	33	0.9 (0.5 to 1.6)			
Female sex	182	79	2.5 (1.5 to 4.2)		2.3 (1.3 to 4.3)	2.0 (1.0 to 4.0)
Symptoms of mental illness at baseline	39	63	11.9 (7.1 to 20.2)			10.7 (5.7 to 20.0)

Bivariate analysis of the association between each independent variable and the outcome. Multivariate analyses performed in three steps: the first model (work) includes all work characteristics with a p value <0.2 in bivariate analysis; in the second model (work and life), the same work related variables were included together with the non-work variables which showed a p value <0.2 in bivariate analysis. In the final model (work, life and symptoms at baseline) symptoms of mental illness at baseline were added to the previous model. Odds ratios with 95% CIs are used as the measure of association.

Depression and anxiety are both recurring diseases which are more, or less, common within different groups. Hence, the disorders are not only genetically predetermined states, but disorders for which work as well as living conditions may be regarded as potential triggers. There is a high prevalence of comorbidity for depressive and anxiety disorders.³⁸ However, the two outcomes were studied separately in order to elucidate different risk factors. The analyses were also repeated with cases with such comorbidity excluded. The results were very similar to those presented.

As lack of instrumental social support was the main risk factor at work for depression, it could be suspected that deteriorated instrumental social support was the crucial component in the variable deteriorated work characteristics associated with an increased risk for depression. This was not the case as separate analyses of deteriorated support and deteriorations in other work characteristics revealed that they all, except decreased influence, seemed to contribute to the increased odds ratio for depression associated with deteriorated work characteristics. However, the precision of each separate odds ratio was, of course, low.

The lack of relation between work characteristics and anxiety may be dependent on the choice of independent variables. The ARIA model which was used to assess work characteristics covers psychosocial externally assessed work exposures in terms of job demands, job control and job social support. It does not include conditions such as insecure employment, which may have been associated with anxiety. Previous research has indicated that both anxiety and depression were highly related to childhood experiences of neglect and abuse while adversity in adult life (for example, widowhood and divorce) was only related to the rate of depression.³⁹ We also performed analyses with depressive and anxiety diagnoses combined as the outcome. However, in these analyses only lack of social support appeared as a significant risk factor but with a smaller odds ratio than in the analyses regarding only depression.

In our analyses we excluded, from the reference category, individuals with low well-being according to the questionnaire in the second phase of the PART study. This seems most reasonable because the original selection of interview participants was based on low or high well-being. However, we also performed analyses with the individuals with low well-being

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but no psychiatric diagnoses included in the referent category. This analysis yielded results that were quite similar to those presented in the tables.

Finally the small number of cases, particularly of depression, is an obvious limitation of the study which excluded gender specific analyses and implied that only strong risk factors could be identified.

Comparisons with previous studies

A recent review concluded that there is considerable evidence that self-reported high demands, low control and low social support are related to psychological distress.⁴⁰ A limited number of studies have investigated work characteristics in accordance with the demand-control-support model or its individual components in relation to diagnoses of depression or anxiety.^{11 12 15 17–19 41} They are all based on self-reported working conditions. Three of these studies were longitudinal.^{15 17 19} These studies support the importance of social support from supervisors and co-workers as an important aspect for preventing mental illness in terms of depression. Bromet and colleagues also found that high demands were related to an increased odds ratio for depression.¹⁵ This is in accordance with our results in terms of time pressure, although our confidence interval included unity when all potential confounders were considered.

Two cross-sectional studies of associations between demand-control-support conditions and psychiatric diagnoses found that high strain environments were associated with increased psychiatric morbidity¹¹ and depressive syndromes.¹²

In our study two job control aspects—that is, decision authority and cognitive requirement—were measured, and these aspects were not related to depression. This latter finding is in accordance with the findings of Wang¹⁵ as well as Bromet *et al*¹⁷ and Ylipaavalneimi.¹⁸

The associations between lack of support from supervisor and psychiatric disorder have also been indicated from case-referent

studies with cross-sectional data collection of exposure and outcome.^{13 14} Our findings of increased risk for depression among those with deteriorated work characteristics are also indicated from cross-sectional studies of changed work characteristics and psychiatric diagnoses. Considerable increase in workload¹³ and organisational changes¹⁰ have been associated with depressive disorders in such studies.

CONCLUSION

Externally assessed work characteristics, in terms of hindrances for instrumental support from colleagues and supervisors, and deterioration in psychosocial work characteristics were associated with increased odds ratios for diagnoses of depression. Findings for anxiety were similar but not statistically significant. Lack of instrumental support from colleagues and supervisors was defined as a hindrance to satisfactory job performance and did not include the aspect of social climate. This implies that employees who strive to do a good job, with clearly deficient organisational support, may be at increased risk of depression.

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Main messages

- Studies of relationships between work characteristics and psychiatric disorders may be biased by over-reporting of unfavourable work characteristics among those with psychiatric disorders. This study attempts to account for this bias by using external assessment.
- The results indicate that hindrances in terms of lack of instrumental support from colleagues and supervisors and deterioration in psychosocial work characteristics were associated with increased odds ratios for diagnoses of depression. Findings for anxiety were similar but not statistically significant when factors outside work and symptoms at baseline were considered.

Policy implications

- Lack of instrumental support from colleagues and supervisors was defined as a hindrance to satisfactory job performance and did not include the aspect of social climate. This implies that employees who strive to do a good job, with clearly deficient organisational support may be at increased risk of depression.

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