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Anxiety and depression in the working population using the HAD Scale

Psychometrics, prevalence and relationships with psychosocial work characteristics

■ **Abstract** *Background* The purposes of this study were: 1) to explore the psychometric properties of the HAD Scale in the working population, 2) to determine the prevalence of anxiety and depression on two severity levels among employees, and 3) to examine whether psychosocial work-related determinants for both categories of mental health problems may differ. *Methods* Data were taken from 7482 employees participating in the epidemiological Maastricht Cohort Study on Fatigue at Work. Anxiety and depression were measured with the easy to administer self-report Hospital Anxiety and Depression (HAD) Scale, while several questionnaires and self-formulated questions were used to measure psychosocial work-related characteristics. *Results* A principal component analysis indicated that the HAD Scale enables measuring anxiety and depression as separate constructs among employees. On a subclinical level, prevalences of anxiety and depression were both considerable: anxiety prevalences were 8.2 % for males and 10 % for females, and depression prevalences were 7.1 % for males and 6.2 % for females. Regarding self-reported psychosocial work characteristics, in multivariate regression analyses partly differential cross-sectional associations were found for anxiety and depression. *Conclusions* The results indicate that subclinical anxiety and depression are considerable in the working population and provide suggestive evidence that diagnosing, preventing or managing anxiety and depression among employees may require focusing on different aspects of their psychosocial work environment.

■ **Key words** employees – HAD Scale – mental health – psychometrics – psychosocial work environment – questionnaires

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Introduction

Mental ill-health is not only common in the working population (Chevalier et al. 1996; Bültmann et al. 2002), but various studies have also repeatedly shown that mental ill-health is also associated with a substantial degree of functional disability and work impairment (Jenkins 1993; Stansfeld et al. 1995; Schroër 1997). For example, one in every three work disability benefit recipients is classified as being disabled for work on mental grounds in the Netherlands (Houtman 1999).

Several clusters of mental health problems can be distinguished. Both anxiety and depression have been shown to be related to a diminished performance and functioning of employees in the occupational setting (Broadhead et al. 1990; Conti and Burton 1994; Martin et al. 1996; Kessler and Frank 1997; Dewa and Lin 2000; Laitinen-Krispijn and Bijl 2000;). Depressive and anxiety symptoms have often been investigated as separate mental health entities. Although depressive and anxiety disorders represent two separate categories of (minor) psychiatric disorders on a clinical level (APA 1994), we

do know from community and clinical studies that measures of anxiety correlate fairly well with measures of depression (Ormel et al. 1995; Stein 1995; Gorman 1996; Nisenson et al. 1998; Regier et al. 1998).

In the working population, however, only a few studies used instruments that enable a direct distinction between depression and anxiety, thereby taking into account the severity of both mental health problems and their associations with (psychosocial) work factors (Chevalier et al. 1996; Laitinen-Krispijn and Bijl 2002). So far, most studies in the working population have used general measurements (for example, the General Health Questionnaire) to examine the presence of mental ill-health, or have focused on only one specific type of mental health problem, most often depression (Stansfeld 2002). Consequently, some issues remain unresolved, such as: 'What is the prevalence of different severity levels of anxiety and depressive symptoms in the working population?', and, in the light of preventive or treatment actions for anxiety and depression, 'Are anxiety symptoms conceptually distinct from depressive symptoms in the working population?'. In the present study, we used the Hospital Anxiety and Depression (HAD) Scale, an instrument enabling the measurement of both anxiety and depressive symptoms on different severity levels, for the first time in a working population. The HAD-scale was used to examine whether anxiety symptoms are conceptually different from depressive symptoms, and to determine prevalences of anxiety and depressive symptoms on different severity levels and in several subgroups. Furthermore, we examined possible differential associations between psychosocial work characteristics and anxiety and depression.

Subjects and methods

■ Study population

Between May 1998 and January 2001, a large-scale prospective epidemiological cohort study, the Maastricht Cohort Study on Fatigue at Work, was conducted in The Netherlands. A total of 12 140 employees from 45 different companies and organisations completed and returned the self-report baseline questionnaire in May 1998 (response rate of 45 %). Follow-up information was obtained every fourth month by self-report questionnaires. Full details about the design of the cohort study, baseline characteristics of the study population and a non-response analysis have been described elsewhere (Bültmann et al. 2002; Kant et al. 2003). Data about anxiety and depression were gathered in January 2001. In total, 7472 employees, 2048 females (27.4 %) and 5424 males (72.6 %), completed and returned this follow-up questionnaire (response rate of 70 % with respect to the baseline population). Compared to female cohort participants (mean 43.1 years, sd 8.3), male cohort participants (mean 38.7 years, sd 8.3) were younger [t(7460) = 20.4, p < 0.001]. Information about psychosocial work characteristics was gathered in May 2000.

■ Measurements

Anxiety and depression

The Hospital Anxiety and Depression (HAD) Scale was used to measure the presence of anxiety and/or depression. The HAD Scale is a 14-item self-report questionnaire, assessing the presence and severity of both anxiety (HAD-A subscale; 7 items) and depression (HAD-D subscale; 7 items) separately (Zigmond and Snaith 1983). Both subscales are scored on a four-point Likert scale (0 to 3), resulting in a range of 0 to 21. Cronbach's alphas in our study population were for HAD-A 0.85 and 0.84 for females and males, respectively, and for HAD-D 0.86 and 0.85 for females and males, respectively. The Pearson intercorrelation between HAD-A and HAD-D was 0.74 for both genders.

Although the HAD Scale was originally developed to identify caseness of anxiety disorders and depression among patients in nonpsychiatric hospital clinics (Zigmond and Snaith 1983), the questionnaire also performs well in assessing the symptom severity and caseness of anxiety disorders and depression in somatic, psychiatric and primary care patients and in the general population (Bjelland et al. 2002). With respect to cut-off values, we followed suggestions proposed by this review. Employees were defined as being a *possible case* of having an anxiety or depressive disorder when they scored 8 or higher on the HAD-A or on the HAD-D, respectively. The authors of the original HAD Scale also proposed a higher threshold score for more clinically significant degrees of anxiety or depressive disorders (Zigmond and Snaith 1983). In line with the authors' suggestion, we defined employees as being a *subclinical case* of having an anxiety or depressive disorder when they scored 11 or higher on the HAD-A or on the HAD-D, respectively.

Psychosocial work characteristics

A validated Dutch version of the Job Content Questionnaire (Houtman 1995) was used to measure *psychological job demands* (5 items), *decision latitude* (9 items) and *social support* at work (8 items) (Karasek 1979, 1985; Karasek and Theorell 1990; Houtman 1995). The responses for all items are scored on a four-point Likert scale, varying from 'strongly disagree' to 'strongly agree'. Tertile splits were used for psychological job demands and decision latitude, while social support was dichotomized at the median. *Emotional demands* at work (i. e. being confronted with personally upsetting things, personally attacked or threatened, getting annoyed with others, moving work situations, and shocking events at work), were measured by means of two items of the Questionnaire on the Experience and Assessment of Work (Veldhoven and Meijman 1994), two items of the Questionnaire on Work and Health (VAG; Gründemann et al. 1993), and one self-formulated item. The response option for each item was yes/no. The five items were summed up to generate a total score, ranging from 0 to 5. We recoded emotional demands at work to no emotional demands (score 0), low emotional demands (score 1), and high emotional demands (score 2–5). Three single items from the Dutch questionnaire on perception and judgment of work (Veldhoven and Meijman 1994) were used to measure the presence of a *conflict with supervisor* (yes/no), *conflict with co-workers* (yes/no), and *job insecurity* (yes/no). Furthermore, we measured whether participants occupied an *executive function* (yes/no), and whether they would describe their overall *job satisfaction* as positive (good/reasonable) or as negative (moderate/not good).

Sociodemographic and health characteristics

The respondents provided information on age, educational level (low, medium, high), living alone (yes/no), the presence of at least one chronic condition with (psycho)somatic characteristics (e. g. heart problems, diabetes, cancer, respiratory disorders, metabolic disorders, musculoskeletal problems), or psychological problems. Age and educational level were measured at baseline (May 1998), while the other sociodemographic and health characteristics were measured in May 2000.

Statistical analyses

Statistical analyses were performed with SPSS 10.0. Employees with incomplete data were excluded from the analyses. All analyses were stratified for gender. To explore whether the HAD-A and HAD-D are able to measure anxiety and depression as different constructs in the working population, Principal Component Analysis (PCA) was used to investigate the factor structure of the HAD-A and HAD-D. We used

a PCA with an oblique rotation, as this rotation takes the correlation between anxiety and depression into account. The correlation matrix eigenvalues (eigen value > 1 criterion), and the factor loadings of individual items across factors were used to indicate the acceptability of a factor solution. The factors were checked on the presence of double loadings and cross loadings. Factor loadings above 0.3 were considered as statistically significant.

Continuous scores for both anxiety and depression and prevalences within possible and subclinical cases were calculated for the total study population (n = 7472). By means of stratifications for demographic characteristics and work and health status, continuous and dichotomized anxiety and depression score were also compared between subgroups.

Associations between psychosocial work characteristics (independent variables) and subclinical anxiety or depression cases (dependent variables) were studied by means of multiple logistic regression analyses. Employees absent from work (7.7 %; n = 572), working under modified conditions after former sickness absence (for example, fewer hours, modified tasks or other functions; 3.3 %; n = 245), or with an unknown working status in January 2001 (1 %; n = 80) were excluded. Among the remaining employees active at work (n = 6575), we wanted to focus on anxiety and depression complaints not yet labeled as (co)morbidity of chronic somatic problems. Therefore, we also excluded employees reporting psychological problems as a category of chronic conditions in the May 2000 questionnaire (2.8 %; n = 187, with missing data in 0.2 %; n = 16), and controlled for the presence of other chronic conditions.

Consequently, the final population studied in the multiple regression analyses consisted of 6372 employees: 1676 females (26.3 %) and 4696 males (73.7 %). In three consecutive steps, Odds Ratios (ORs) and their 95 % Confidence Intervals (95 % CI) were calculated for each psychosocial work characteristic separately: 1) on a crude (uncorrected) level, 2) adjusted for age, educational level, living situation and the presence of at least one chronic condition, and 3) additionally adjusted for the continuous score on HAD-D or HAD-A when anxiety or depression was considered as the dependent variable, respectively.

Results

■ Anxiety and depression as separate constructs in the working population

The principal component analysis (PCA) without a restricted total number of factors yielded a two-factor solution. The first factor explained 46.8 % of the variance, the second factor 8.2 %. Table 1 shows the items and factor loadings of the HAD-D and the HAD-A. As the same picture emerged for male and female employees, the results are presented for both genders together.

For all seven depression items, the highest loadings (ranging from 0.50 to 0.83) were present for the first factor. For six out of seven of the anxiety items, the highest factor loadings (ranging from 0.33 to 0.86) were present for the second factor. For one item from the HAD-D (item 8) and for one item from the HAD-A (item 1), clear double loadings (both above 0.3) were present. Only one clear cross loading was found: one item from the HAD-A (item 7) reached a higher loading on the first factor than on the second factor. Since the first factor predominantly consists of items from the HAD-D and the second factor predominantly of items from the HAD-A, it seems justified to use the HAD-A and the HAD-D for measuring anxiety and depression as two distinctive constructs of mental health problems in our working population.

Table 1 Two-factor solution after oblimin rotation as obtained by exploratory factor analysis

Item number questionnaire	Items per subscale*	Factor loadings	
		Factor 1**	Factor 2**
	HAD-A		
1	I feel tense or 'wound up'	0.35	**0.46**
3	I get a sort of frightened feeling as if something awful is about to happen	0.03	**0.86**
5	Worrying thoughts go through my mind	0.17	**0.70**
7	I can sit at ease and feel relaxed	**0.58**	0.25
9	I get a sort of frightened feeling like 'butterflies' in the stomach	0.03	**0.70**
11	I feel restless as if I have to be on the move	0.27	**0.33**
13	I get sudden feelings of panic	0.11	**0.87**
	HAD-D		
2	I still enjoy the things I used to enjoy	**0.80**	0.00
4	I can laugh and see the funny side of things	**0.74**	0.09
6	I feel cheerful	**0.65**	0.19
8	I feel as if I am slowed down	**0.50**	0.32
10	I have lost interest in my appearance	**0.53**	0.05
12	I look forward with enjoyment to things	**0.83**	0.06
14	I can enjoy a good book or radio or TV programme	**0.74**	0.10

* All items have been recoded in the same direction beforehand; ** **Bold** highest loading for each item; *HAD-A* Anxiety subscale of the Hospital Anxiety and Depression Scale; *HAD-D* Depression subscale of the Hospital Anxiety and Depression Scale

■ Prevalence of anxiety and depression in the working population

Table 2 shows that, in the total study population, 20.7 % of male employees were defined as possible anxiety cases, 18.7 % as possible depression cases, 8.2 % as subclinical anxiety cases, and 7.1 % as subclinical depression cases. For female employees, these percentages were 22.4 %, 15.8 %, 10 %, and 6.2 %, respectively.

Overall and irrespective of gender, a higher level of both anxiety and depression, and a higher percentage of possible and subclinical anxiety and depression cases was found in employees not at work or with health problems. Furthermore, only living alone versus not living alone in male employees, and educational level (low/medium/high) in female employees did not reveal significant differences in terms of anxiety or depression scores.

In the total study population, the mean anxiety score was 4.9 (sd 3.6) for males and 5.1 (sd 3.7) for females, representing a statistically non-significant difference (p > 0.05). The mean depression score was 4.0 (sd 3.8) for males and 3.6 (sd 3.7) for females, a statistically significant difference [t(7304) = 7.14, p < 0.001]. As we did not expect males to report a higher depression score than females, we additionally compared the HAD-D scores of males and females in a subpopulation consisting only of employees not working in shifts, working less than 36 hours, without a chronic condition, and not living alone (specific data not presented). In this subpopulation with a minimal confounding effect of health-related, work-related and sociodemographic variables, a statistical difference between mean level of depression for males (3.5, sd 3.4) and for females (3.2, sd 3.5) was no longer found (p > 0.05).

■ Psychosocial work characteristics in male employees

Table 3 shows that in male employees all psychosocial work characteristics were associated with subclinical anxiety (model 1). After adjustment for sociodemographics and the presence of a chronic condition (model 2), all these associations, except for having an executive function, were still significant. Additional adjustment for the continuous score on HAD-D (model 3) resulted in a reduction in size of all ORs. Three ORs remained significant: high emotional demands (OR = 1.95; 95 % CI 1.37–2.77), negative job satisfaction (OR = 1.54; 95 % CI 1.09–2.18), and high psychological job demands (OR = 1.49; 95 % CI 1.01–2.20).

The associations for subclinical depression (Table 4) were comparable to those for subclinical anxiety in terms of crude ORs (model 1) and of ORs after adjustment for sociodemographics (model 2). Additional adjustment for the continuous score on HAD-A (model 3), however, revealed some differential effects. Similarly to subclinical anxiety, all ORs reduced in size, with significant associations for negative job satisfaction

(OR = 2.05; 95 % CI 1.44–2.92) and high emotional demands (OR = 1.60; 95 % CI 1.11–2.31). Contrary to subclinical anxiety, high psychological job demands were not found to be associated with subclinical depression anymore, while significant associations were found for low social support at work (OR = 1.86; 95 % CI 1.34–2.60) and low decision latitude (OR = 1.61; 95 % CI 1.09–2.38).

■ Psychosocial work characteristics in female employees

Table 5 shows that in female employees all psychosocial work characteristics except for having an executive function and job insecurity were significantly associated with subclinical anxiety (model 1). The same picture emerged after adjustment for sociodemographics and the presence of a chronic condition (model 2). Additional adjustment for the continuous score on HAD-D (model 3) resulted in a reduction in size of all ORs, and only three ORs remained significant. As in male employees with subclinical anxiety, negative job satisfaction (OR = 2.12; 95 % CI 1.14–3.94) and high level of emotional demands (OR = 1.88; 95 % CI 1.06–3.32) were found to be associated with subclinical anxiety. In contrast, no associations were found for high psychological job demands anymore. Instead, a significant association was found for conflicts with supervisor (OR = 2.89; 95 % CI 1.30–6.46).

Table 6 shows that for subclinical depression, the associations with psychosocial work characteristics were comparable to those for subclinical anxiety in terms of crude ORs (model 1) and ORs after adjustment for sociodemographics (model 2), except that the OR of decision latitude was non-significant in model 1. After additional adjustment for the continuous score on HAD-A (model 3), significant associations were no longer found.

Discussion

We found that the HAD Scale is able to measure anxiety symptoms separately from depressive symptoms in the working population, that the prevalence of anxiety and depression is considerable among employees, and that anxiety may partly be conceptually different from depression.

To our knowledge, this is the first study to explore psychometric properties of the HAD Scale in a working population. Although psychometrics of the HAD Scale have been examined in other non-clinical populations, only a few of them were samples from the community (Jimenez et al. 1989; Lisspers et al. 1997; Spinhoven et al. 1997). Our identification of two factors, with the first factor consisting predominantly of items from the HAD-D subscale, and the second factor of items from the HAD-A subscale, corresponds with results from a recent review, showing that the HAD Scale performs well as a

Table 2 Levels and prevalences of anxiety and depression for males and females separately, stratified for being at work, reporting at least one chronic condition, reporting psychological problems, living alone, educational level, and age groups

| | Males (n = 5424) | | | | | |
| | HAD-A | | | HAD-D | | |
	Mean score (sd)	Possible case (%)	Subclinical case (%)	Mean score (sd)	Possible case (%)	Subclinical case (%)
Total level	4.9 (3.6)	20.7	8.2	4.0 (3.8)	18.7	7.1
At work:	***	***	***	***	***	***
No (7 %)	5.5 (4.8)	37.3	20.8	5.7 (4.7)	31.4	17.4
Yes	3.4 (3.5)	19.5	7.2	3.9 (3.7)	17.7	6.4
Chronic condition	***	**	***	***	***	***
Yes (21 %)	6.1 (4.0)	32.3	14.4	5.2 (4.1)	29.0	11.4
No	4.5 (3.4)	17.6	6.5	3.7 (3.6)	15.9	6.0
Psychological problems:	***	***	***	***	***	***
Yes (4 %)	9.2 (4.2)	60.2	35.4	8.0 (4.6)	52.7	29.7
No	4.7 (3.5)	19.4	7.2	3.9 (3.7)	17.5	6.4
Living alone:				*		**
Yes (11 %)	5.0 (3.6)	22.3	9.8	4.4 (4.2)	21.1	10.4
No	4.8 (3.6)	20.6	8.0	4.0 (3.7)	18.4	6.8
Educational level:	***	***	***	***	***	***
Low (20 %)	5.4 (4.0)	25.9	11.3	4.8 (4.1)	24.3	9.5
Medium (41 %)	4.8 (3.6)	20.7	8.0	4.0 (3.6)	19.4	7.3
High (39 %)	4.6 (3.4)	17.8	6.6	3.6 (3.6)	14.6	5.6
Age:	***	***	**	***	***	*
18–25 (2 %)	3.9 (2.4)	8.3	–	2.4 (2.5)	6.1	1.2
26–35 (18 %)	4.4 (3.3)	14.8	6.2	3.3 (3.5)	12.9	5.9
36–45 (39 %)	5.0 (3.6)	22.2	8.3	4.2 (3.9)	19.5	7.7
46–55 (37 %)	5.1 (3.7)	23.2	9.5	4.4 (3.8)	21.8	7.7
55–65 (5 %)	4.1 (3.7)	16.0	7.0	3.5 (3.5)	13.9	4.9

| | Females (n = 2048) | | | | | |
| | HAD-A | | | HAD-D | | |
	Mean score (sd)	Possible case (%)	Subclinical case (%)	Mean score (sd)	Possible case (%)	Subclinical case (%)
Total level	5.1 (3.7)	22.4	10.0	3.6 (3.7)	15.8	6.2
At work:	***	***	***	***	***	***
No (11 %)	6.7 (4.7)	35.3	20.3	6.3 (4.7)	30.1	17.2
Yes	5.0 (3.5)	20.9	8.8	4.8 (3.5)	14.2	4.9
Chronic condition:	***	**	***	***	***	***
Yes (24 %)	5.9 (4.0)	28.2	14.5	4.5 (4.0)	21.6	9.8
No	4.9 (3.6)	20.5	8.5	3.4 (3.5)	14.0	5.0
Psychological problems:	***	***	***	***	***	***
Yes (4 %)	8.7 (4.6)	51.8	33.7	6.8 (5.1)	38.6	25.3
No	5.0 (3.6)	21.1	9.0	3.5 (3.6)	14.9	5.4
Living alone:	*	**		**	**	*
Yes (15 %)	5.7 (4.0)	28.7	12.8	4.2 (4.2)	21.5	9.4
No	5.0 (3.7)	21.2	9.4	3.5 (3.6)	14.7	5.6
Educational level:						
Low (11 %)	5.7 (4.2)	28.1	14.3	4.1 (3.4)	19.0	8.1
Medium (54 %)	5.0 (3.8)	21.7	10.2	3.6 (3.7)	16.1	6.4
High (35 %)	5.1 (3.5)	21.9	8.6	3.6 (3.5)	15.0	5.0
Age:		*		***	**	
18–25 (5 %)	4.8 (3.8)	16.7	9.3	2.7 (3.4)	11.0	5.5
26–35 (32 %)	5.0 (3.6)	20.9	9.2	3.4 (3.6)	14.4	5.1
36–45 (40 %)	5.1 (3.7)	21.5	8.9	3.5 (3.6)	14.0	5.8
46–55 (20 %)	5.6 (3.9)	28.1	13.3	4.4 (4.0)	23.1	8.6
55–65 (2 %)	5.0 (3.9)	22.9	14.6	4.0 (3.7)	14.6	8.3

HAD-A Anxiety subscale of the Hospital Anxiety and Depression Scale; *HAD-D* Depression subscale of the Hospital Anxiety and Depression Scale; *sd* standard deviation

Table 3 Odds Ratios (OR) and 95 % confidence intervals (95 % CI) for subclinical anxiety among men by work characteristics[a]

Variable	Level	OR model 1	95 % CI	OR model 2	95 % CI	OR model 3	95 % CI
Psychological job demands	High	2.50***	1.79–3.49	2.60***	1.86–3.64	1.49*	1.01–2.20
	Medium	1.25	0.82–1.89	1.30	0.85–1.97	1.12	0.69–1.80
	Low	1		1			
Decision latitude	Low	2.07***	1.53–2.80	2.04***	1.48–2.82	1.19	0.82–1.73
	Medium	1.39*	1.00–1.91	1.36	0.98–1.88	1.06	0.72–1.54
	High	1		1			
Social support	Low	2.21***	1.70–2.87	2.13***	1.63–2.77	1.11	0.81–1.51
	High	1		1			
Emotional demands	High	4.24***	3.15–5.72	4.08***	3.01–5.52	1.95***	1.37–2.77
	Low	1.82***	1.30–2.54	1.77***	1.26–2.48	1.25	0.85–1.84
	No	1		1			
Conflict with:							
Supervisor	Yes	1.99**	1.29–3.08	2.00**	1.29–3.10	1.11	0.65–1.87
	No	1		1			
Co-worker	Yes	2.16***	1.52–3.07	2.13***	1.50–3.04	1.25	0.82–1.92
	No	1		1			
Executive function	Yes	1.37*	1.04–1.81	1.33	1.00–1.78	1.17	0.84–1.64
	No	1					
Job insecurity	Yes	1.85***	1.34–2.54	1.71**	1.23–2.37	1.23	0.84–1.80
	No	1					
Job satisfaction	Negative	3.80***	2.85–5.06	3.67***	2.75–4.91	1.54*	1.09–2.18
	Positive	1					

[a] n ranges between 4394 and 4486 due to missing values in the psychosocial work characteristics
* p < 0.05; ** p < 0.01; *** p < 0.001
Model 1: Crude Odds Ratios
Model 2: Adjusted for age, educational level, living alone, and presence of chronic condition
Model 3: Additionally adjusted for continuous depression score

Table 4 Odds Ratios (OR) and 95 % confidence intervals (95 % CI) for subclinical depression among men by work characteristics[a]

Variable	Level	OR model 1	95 % CI	OR model 2	95 % CI	OR model 3	95 % CI
Psychological job demands	High	2.52***	1.78–3.57	2.72***	1.91–3.86	1.42	0.94–2.15
	Medium	1.28	0.83–1.97	1.35	0.88–2.09	1.22	0.74–2.01
	Low	1		1			
Decision latitude	Low	2.58***	1.89–3.52	2.41***	1.73–3.37	1.61*	1.09–2.38
	Medium	1.28	0.90–1.28	1.22	0.86–1.75	1.00	0.66–1.51
	High	1		1			
Social support	Low	2.81***	2.11–3.75	2.69***	2.02–3.59	1.86***	1.34–2.60
	High	1		1			
Emotional demands	High	4.47***	3.27–6.10	4.21***	3.07–5.78	1.60*	1.11–2.31
	Low	1.86**	1.30–2.64	1.76	1.24–2.51	1.15	0.78–1.72
	No	1		1			
Conflict with:							
Supervisor	Yes	2.53***	1.67–3.84	2.49***	1.64–3.80	1.50	0.91–2.48
	No	1		1			
Co-worker	Yes	2.48***	1.74–3.51	2.37***	1.67–3.38	1.45	0.95–2.21
	No	1		1			
Executive function	Yes	1.39	1.03–1.86	1.27	0.94–1.27	1.13	0.80–1.61
	No	1					
Job insecurity	Yes	1.80**	1.29–2.51	1.66**	1.18–2.34	1.09	0.73–1.64
	No	1					
Job satisfaction	Negative	4.58***	3.43–6.11	4.35***	3.26–5.82	2.05***	1.44–2.92
	Positive	1					

[a] n ranges between 4394 and 4486 due to missing values in the psychosocial work characteristics
* p < 0.05; ** p < 0.01; *** p < 0.001
Model 1: Crude Odds Ratios
Model 2: Adjusted for age, educational level, living alone, and presence of chronic condition
Model 3: Additionally adjusted for continuous anxiety score

Table 5 Odds Ratios (OR) and 95 % confidence intervals (95 % CI) for subclinical anxiety among women by work characteristics[a]

Variable	Level	OR model 1	95 % CI	OR model 2	95 % CI	OR model 3	95 % CI
Psychological job demands	High	2.54**	1.50–4.29	2.57**	1.51–4.37	1.33	0.69–2.58
	Medium	1.80*	1.01–3.21	1.82*	1.02–3.25	1.02	0.55–1.90
	Low	1		1			
Decision latitude	Low	2.05**	1.31–3.23	1.95**	1.22–3.11	1.67	0.95–2.92
	Medium	1.30	0.79–2.12	1.28	0.78–2.10	1.32	0.73–2.36
	High	1		1			
Social support	Low	2.76***	1.88–4.05	2.73***	1.86–4.03	1.53	0.97–2.43
	High	1		1			
Emotional demands	High	2.74***	1.70–4.43	2.66***	1.64–4.32	1.88*	1.06–3.32
	Low	1.57	0.91–2.72	1.57	0.91–2.72	1.18	0.61–2.25
	No	1		1			
Conflict with:							
Supervisor	Yes	4.34***	2.34–8.05	4.08***	2.17–7.67	2.89**	1.30–6.46
	No	1		1			
Co-worker	Yes	3.18***	1.74–5.79	3.09***	1.68–5.67	1.65	0.78–3.52
	No	1		1			
Executive function	Yes	1.16	0.66–2.03	1.12	0.63–1.99	1.40	0.70–2.80
	No	1					
Job insecurity	Yes	1.52	0.87–2.65	1.46	0.83–2.55	1.10	0.54–2.22
	No	1					
Job satisfaction	Negative	3.83***	2.33–6.30	3.81***	2.30–6.33	2.12*	1.14–3.94
	Positive	1					

[a] n ranges between 1484 and 1523 due to missing values in the psychosocial work characteristics
* p < 0.05; ** p < 0.01; *** p < 0.001
Model 1: Crude Odds Ratios
Model 2: Adjusted for age, educational level, living alone, and presence of chronic condition
Model 3: Additionally adjusted for continuous depression score

Table 6 Odds Ratios (OR) and 95 % confidence intervals (95 % CI) for subclinical depression among women by work characteristics[a]

Variable	Level	OR model 1	95 % CI	OR model 2	95 % CI	OR model 3	95 % CI
Psychological job demands	High	4.10**	1.82–9.25	4.30***	1.90–9.77	1.84	0.76–4.49
	Medium	1.98	0.79–4.95	2.03	0.81–5.09	1.15	0.42–3.13
	Low	1		1			
Decision latitude	Low	1.49	0.83–2.69	1.32	0.72–2.42	0.74	0.37–1.56
	Medium	0.98	0.52–1.88	0.92	0.48–1.77	0.76	0.37–1.56
	High	1		1			
Social support	Low	3.27***	1.92–5.56	3.28***	1.92–5.61	1.76	0.94–3.28
	High	1		1			
Emotional demands	High	2.39**	1.26–4.51	2.32*	1.22–4.42	1.29	0.57–2.96
	Low	1.67	0.82–3.40	1.67	0.82–3.41	1.25	0.59–2.66
	No	1		1			
Conflict with:							
Supervisor	Yes	2.67*	1.11–6.48	2.72*	1.11–6.68	0.75	0.25–2.23
	No	1		1			
Co-worker	Yes	3.50**	1.66–7.39	3.61**	1.69–7.71	1.95	0.77–4.94
	No	1		1			
Executive function	Yes	1.15	0.54–2.54	1.00	0.46–2.19	1.09	0.45–2.65
	No	1					
Job insecurity	Yes	1.82	0.91–3.65	1.69	0.84–3.40	1.48	0.66–3.31
	No	1					
Job satisfaction	Negative	3.13**	1.62–6.07	3.27**	1.67–6.38	1.09	0.48–2.45
	Positive	1					

[a] n ranges between 1484 and 1523 due to missing values in the psychosocial work characteristics
* p < 0.05; ** p < 0.01; *** p < 0.001
Model 1: Crude Odds Ratios
Model 2: Adjusted for age, educational level, living alone, and presence of chronic condition
Model 3: Additionally adjusted for continuous anxiety score

bidimensional test (Bjelland et al. 2002). Similar to our results, the factor loadings found in the reviewed studies were not entirely consistent with the HAD-A and the HAD-D. Most consistently, HAD-A item "I can sit at ease and feel relaxed" (item 7) showed relatively low loadings on the anxiety factor, and higher loadings on the depression factor. Despite the not entirely perfect match between the two factors and the HAD-A and the HAD-D, it seems justified to use the HAD subscales to measure anxiety and depression as separate constructs in the working population.

For our total study population, the prevalence of subclinical anxiety was 8.2 % for males and 10 % for females, while prevalences for possible caseness were 20.7 % and 22.4 %, respectively. As we are not aware of other studies using questionnaires to measure anxiety prevalences in the working population for male and female employees separately, we compared the prevalences on a subclinical level to available results from other studies in working populations, based on structured interviews and reporting annual prevalences for anxiety disorders (Chevalier et al. 1996; Thiebaut et al. 1999; Laitinen-Krispijn and Bijl 2002). Overall, the subclinical anxiety prevalence for males found in our study seems comparable to these studies, while the subclinical anxiety prevalence for females in our study seems to be lower.

The prevalence of subclinical depression was 7.1 % for males and 6.2 % for females. Similarly to subclinical anxiety, the subclinical depression prevalence for males in our study population seems comparable to other studies based on DSM-III-R classifications and presenting annual depression prevalences (Chevalier et al. 1996; Kessler and Frank 1997; Thiebaut et al. 1999; Bildt and Michelsen 2002; Laitinen-Krispijn and Bijl 2002), while the subclinical depression prevalence for females in our study seems to be lower.

Although different study samples, different working populations, and different types of prevalences complicate a direct comparison between our and other studies, our findings might indicate that a considerable percentage of employees is likely to experience a clinically significant degree of anxiety or depressive disorder. It is difficult, however, to determine whether it is justified to compare our subclinical prevalences directly to annual prevalences derived from standard diagnostic tools. As we know from Bjelland et al. (2002), the HAD Scale performs well in assessing the symptom severity and caseness of anxiety disorders and depression in different populations. For a further validation of the subclinical anxiety and depression prevalences in the working population, however, future research should explore whether the short and easy to administer HAD Scale may be a reliable and valid alternative for the more time-consuming standard diagnostic tools.

The response rate of the baseline cohort questionnaire in May 1998 (response rate 45 %) and of the follow-up questionnaire in January 2001 (response rate 70 % in comparison to the baseline questionnaire) might have had an influence on the prevalences reported in our study. Although we did not have information about separate anxiety and depression scores in the baseline measurement of the Maastricht Cohort Study, a survey including an inquiry about fatigue among 600 non-responders indicated that non-responders were less fatigued than the respondents at baseline (Kant et al. 2003). As level of fatigue was found to correlate fairly well ($r = 0.62$) with level of mental health problems (Bültmann et al. 2002), an overestimation of the prevalences of anxiety and depression reported in our study cannot be ruled out. On the other hand, a non-response analysis after 1-year follow-up in the Maastricht Cohort Study indicated that drop-outs reported higher fatigue levels at baseline than respondents (van Amelsvoort et al. 2004). Possibly, this non-response might have led to an underestimation of the prevalence of anxiety and depression reported in our study. It is difficult, however, to estimate the precise effect of a response bias on the presented prevalences.

With a view towards defining possible targets for primary or secondary prevention of anxiety and depression among employees, our study provides support for partly differential associations between psychosocial work characteristics and anxiety and depression. Specifically for subclinical anxiety, associations were found with high psychological job demands in males and with conflicts with supervisors in females. For subclinical depression, associations were found with low decision latitude and low social support for males. As no differences between non-responders and responders regarding psychosocial work characteristics were found within the Maastricht Cohort Study (Kant et al. 2003), non-response is not likely to have an effect on the reported associations.

Results from NEMESIS, a large-scale epidemiological study on the presence of psychiatric morbidity in the general and working population in the Netherlands also support some differential effects of psychosocial work characteristics on anxiety and depression (Laitinen-Krispijn and Bijl 2002). Results from a French case-control study about occupational factors of anxiety and depressive disorders also suggested that employees' perception of their work environment may contribute to the development of anxiety and depressive disorders (Chevalier et al. 1996). Contrarily, another French study about occupational covariates of mood and anxiety disorders found no relations with psychosocial work characteristics. However, the specific occupational group (female ancillary staff), small study population, and relatively high impact of missing values (Thiebaut et al. 1999) possibly contributed to this contrasting finding.

We also found non-specific associations with subclinical anxiety and depression, in the form of higher levels of emotional job demands and negative job satisfaction. As these characteristics may represent multidimensional rather than unidimensional measurements, it would be interesting to study in more detail whether certain aspects of these measurements are specifically related to anxiety or depressive complaints. In line with

our differential results, Stansfeld (2002) suggested that job demands (possibly containing the threat to become overloaded) are specifically associated with anxiety symptoms, whereas low decision latitude (possibly implying loss of or insufficient control) is associated with depressive symptoms (Broadbent 1985; Warr 1990). Although the explorative background of our study is not strong enough to provide conclusive evidence for the existence of two different concepts, taken together our findings support the notion of different underlying concepts for anxiety and depression.

With respect to our results, several issues have to be acknowledged. Firstly, we had to rely on self-report measures for all variables. Related to this, we cannot rule out the possibility that common method variance and the influence of a 'third factor' (for example, negative affectivity) has led to biased prevalences and spurious associations between psychosocial work characteristics and anxiety or depression. In light of this, however, it is important to realise that, even after adjustment for the continuous level of depression or anxiety, psychosocial work characteristics were still associated with subclinical anxiety or depression, respectively. Furthermore, in a large-scale study incorporating the measurement of mental health problems in a UK working population (the Whitehall II study), most associations between psychosocial work characteristics and mental health were still present after adjustment for negative affectivity (Stansfeld et al. 1999). Secondly, the effect of the time span of 10 months between the measurement of the psychosocial work characteristics (May 2000) and the measurement of anxiety and depression (January 2001) on our study results depends on the stability of the psychosocial work characteristics. Where most work characteristics were assumed to be relatively stable (for example, decision latitude and emotional demands), others, like job insecurity and conflicts, may have changed during 10 months, implying that associations between these work characteristics and anxiety and depression would be attenuated. A third point of attention is that anxiety and depression in the workforce can both be influenced by more than psychosocial work characteristics alone. Although we took sociodemographics and chronic diseases into account as confounders, other work-related factors (for example, effects of department restructuring) and factors outside work (for example, relational problems) were also found to be associated with either anxiety or depression in the working population (Chevalier et al. 1996), underlining the multifactorial etiology of anxiety and depression.

In conclusion, the results of this study indicate that the HAD Scale enables a distinction between anxiety and depression in the working population. A considerable prevalence of anxiety and depression among employees on a level that may be considered as clinically relevant was found. The findings also suggest some differential effects between psychosocial work characteristics and anxiety and depression. In terms of managing or preventing mental health problems in the working population, our results encourage longitudinal studies focusing on causal relationships between psychosocial work characteristics and mental disorders. As psychosocial work characteristics represent potentially modifiable work-related conditions with a possible (partly) differential effect on anxiety and depression, the findings also promote examining whether improving employees' psychosocial work environment has a positive effect on the presence of anxiety or depression in the workforce.

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