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Running head: Work engagement, overcommitment and asthma outcomes

Asthma self-management at work, asthma morbidity, and the subjective prognosis of gainful employment – the role of work engagement and overcommitment: a cross-sectional study

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Abstract

Objective

Work engagement is considered a constructive and satisfying state of mind promoting well-being, whereas overcommitment contributes to ill-health. We investigated if these psychosocial factors are related to asthma self-management at the workplace (i.e., physical activity, trigger avoidance, acute symptom management, communication), asthma control, asthma-specific quality of life, and the subjective prognosis of gainful employment among employees with asthma.

Methods

Questionnaires were distributed in three pulmonary rehabilitation clinics (10/2017-05/2018) in Germany. Work engagement was measured by three items from the Copenhagen Psychosocial Questionnaire and overcommitment by six items from the effort-reward imbalance questionnaire. Asthma self-management was mainly assessed by self-developed items, asthma morbidity by the Asthma Control Test and the Marks Asthma Quality of Life Questionnaire, and the subjective prognosis of gainful employment by a validated three-item scale. After dichotomization of all variables we ran Poisson regression analyses to calculate multivariable prevalence ratios with 95% confidence intervals.

Results

The sample comprised 221 individuals with asthma. Low work engagement was related to physical inactivity. Low work engagement and high overcommitment were associated with inadequate trigger avoidance and acute symptom

management, reduced asthma-specific quality of life, and a poor prognosis of gainful employment. No relationships were observed with communication or asthma control.

Conclusions

Our findings highlight the potential contribution of high levels of work engagement to adequate asthma self-management, good quality of life, and a positive subjective prognosis of gainful employment among employees with asthma. Overcommitment shows associations with those outcomes in the opposite direction, which suggests a detrimental role in asthma.

Keywords: Asthma control, communication, physical activity, quality of life, symptom management, trigger avoidance, workplace

Introduction

Work engagement (or job engagement) is defined as “a positive, fulfilling, work-related state of mind that is characterized by vigour, dedication, and absorption” (1). In this context, vigour implies activation, i.e., high energy levels and the investment of effort in the tasks to be done at work, whereas dedication refers to identification, i.e., the involvement into one’s work and the experience of its significance (1, 2). Absorption comprises high levels of concentration, the feeling of time passing quickly, and difficulty in detaching from work (1, 2).

Thus, work engagement serves as an indicator of work-related well-being (3). Until now, research has mainly focused on the predictors of work engagement and its influence on work performance, especially among health-care professionals (4, 5). There is evidence suggesting though that work engagement is also beneficial to employees’ health, e.g., reducing the risk of a major depressive episode (6) or of long-term sickness absence due to mental illness (7).

However, there are also findings suggesting that high levels of work engagement may be detrimental to employees’ health in terms of increased psychological distress (8). What Bakker et al. (3) refer to as “a dark side of engagement” may result in energy drain, burnout, and ill-health. One concept to additionally cover this phenomenon could be overcommitment. Individuals with high levels of overcommitment show excessive commitment to their work and a strong desire for approval, which can lead to surpassing efforts, strain, and frustration (9). Overcommitment is a key construct in the so-called effort-reward imbalance model (9, 10) and was shown to be closely related to burnout (11, 12).

To our knowledge, there is very limited evidence addressing how work engagement or overcommitment relate to health outcomes in employees with a chronic disease, including asthma, and their ability to self-manage their illness at the workplace. Asthma self-management comprises trigger avoidance, monitoring of symptoms, coping with acute symptoms, and communication (13). Based on a prior qualitative study, we observed that employees with asthma who were committed to their work reported to be reluctant to leave their workplace to see their physician for their routine check-up (14). Furthermore, a previous cross-sectional study by our group was the first to show that high levels of overcommitment are related to poorer asthma control and reduced quality of life among employees with asthma (15). Also, various asthma-related outcomes were related to psychosocial working conditions, i.e., job decision latitude (i.e., an employee’s control over their tasks and when and how to carry them out (16, 17)) and social support at work, as an epidemiological study by our research group suggested. These outcomes were asthma self-management at work, symptom control, asthma-specific quality of life, and the subjective prognosis of gainful employment (18, 19).

As a next step, we now aim to investigate if there are associations of the abovementioned asthma-specific outcomes with work engagement and overcommitment based on the data from our epidemiological study (18, 19). Examining work engagement and overcommitment implies that we focus on cognitive, behavioural, and emotional reactions to working conditions. We expand earlier evidence (15) by addressing outcomes such as asthma self-management and the subjective prognosis of gainful employment besides asthma-specific measures like asthma control and asthma-specific quality of life. Thus, this endeavour adds further insight into the potential mechanisms linking psychosocial working conditions to asthma outcomes.

Method

Study population

In three cooperating clinics, individuals with asthma in in-patient pulmonary rehabilitation (PR) completed questionnaires between October 2017 and May 2018. In total, 755 questionnaires were distributed to patients with asthma by mail before (Klinik Bad Reichenhall der DRV Bayern Süd) or in face-to-face contact during the first week (Nordseeklinik Borkum der DRV Rheinland, Median Klinik Heiligendamm) of their PR

The following inclusion criteria were applied to recruit patients:

- 1.a diagnosis of and current treatment for asthma, but not chronic obstructive pulmonary disease (COPD), according to admission diagnoses checked by the treating physician and confirmed by patient reports;
2. employment of at least 20 working hours per week in the last six months;
3. having worked with the diagnosis for at least six months.

Study setting

The study among patients with asthma was conducted in rehabilitation clinics. PR aims to improve the patients' health status and to thereby secure social participation including workability. To achieve this, PR comprises various interventions such as patient education, general training how to cope with and accept the condition, physical training, physiotherapy, ergotherapy, relaxation techniques, and smoking cessation programmes. This set of interventions is delivered in inpatient or – less frequently– outpatient setting. Key target groups are patients with COPD and/or asthma (8). In case of asthma, PR is recommended when patients face physical, mental, or social impairment due to their condition, including persisting symptoms and lacking asthma control (11). Inpatient PR usually takes three to four weeks. In most cases, either the health insurance or the German Pension Fund covers the cost for the PR. The key criterion to apply for medical rehabilitation to the German Pension Fund is that gainful employment is impaired or at risk of impairment.

Ethical approval

All participants provided written informed consent before taking part in the study. Our study received ethical approval by the Institutional Review Board of the Medical Faculty of the Heinrich-Heine-University of Düsseldorf (no. 5764R).

Measures

An overview of all determinants and outcome variables is given in Table 1.

[Please insert Table 1 around here.]

Work engagement and overcommitment

Three items of the Copenhagen Psychosocial Questionnaire (20, 21) assessed the three dimensions of work engagement (Cronbach's Alpha: $\alpha = 0.87$): vigour ("At my work, I am full of energy"), dedication ("I am enthusiastic about my work"), and absorption ("I am immersed in my work"). The frequency-based five-tier answer format ranges from "always" to "never/hardly ever", the calculated mean score of the transformed values (no missing accepted) ranges from 0 to 100 (higher value representing higher work engagement). The variable was dichotomized at the bottom tertile of its distribution (bottom tertile [high-risk group] = low work engagement; remainder [reference group] = high work engagement). This approach has been adopted in previous studies on psychosocial working conditions (18, 19, 22-24).

The overcommitment-scale of the ERI questionnaire (22, 25) comprises six items (Cronbach's Alpha: $\alpha = 0.79$), e.g., "As soon as I get up in the morning I start thinking about work problems" or "When I get home, I can easily relax and 'switch off' work" (to be scored reversely). The answer format offers four options ranging from "strongly agree" to "strongly disagree". The calculated sum-score ranges from 6 to 24 (higher value indicating higher overcommitment, no missing accepted). Just like work engagement, overcommitment was dichotomized at its tertile. As overcommitment represents a risk factor rather than a health-promoting factor (in contrast to work engagement), the high-risk group was defined by the top tertile (high overcommitment; remainder [reference group] = low overcommitment).

Asthma self-management

An item of the Survey of Health, Ageing and Retirement in Europe, which had been used before (18, 19, 26, 27), assessed physical activity ("How often do you engage in vigorous physical activity, such as sports, heavy housework, or a job that involves physical labour?"). Sufficient physical activity was defined as "more than once a week" (vs. once a week, one to three times a month, hardly ever, or never) based on previous research (28, 29).

Further self-management behaviours were assessed in terms of unfulfilled needs concerning trigger avoidance (one item: "In my everyday work, I largely avoid the triggers that are relevant to me (e.g., pollen, dust, exercise, smells)"), acute symptom management (seven items, e.g., "In case of acute asthma symptoms, I promptly take breaks in my everyday work."), and communication (two items, e.g., "I openly talk to my colleagues about my asthma.") (18). The answer format for the behaviour-descriptive items offered three options: "No, but I would like to" as an unfulfilled need (scored as 1) and "Yes, I do this" or "No, I do not need this" as a fit of need and working conditions (scored as 0). Higher scores reflect more unfulfilled needs. A detailed description of how we assessed and processed the variables can be found in our previous work (18).

Asthma morbidity

Asthma control was measured by the Asthma Control Test (five items, sum-score ranging from 5 to 25, higher values indicating better asthma control, no missing values), and the cut-off was set at 20 points (not well controlled: < 20 ; controlled ≥ 20) (30, 31). Asthma-specific quality of life was assessed by the Marks Asthma Quality of Life Questionnaire (20 items, mean ranging from 0 to 10, lower values indicating better quality of life, four missing values accepted) (32, 33). We dichotomized at the tertile (top tertile [high-risk group] = low quality of life; remainder [reference group] = high quality of life) (34).

Subjective prognosis of gainful employment

The instrument assessing the subjective prognosis of gainful employment developed by Mittag and Raspe (35, 36) consists of three items. For the first item (“When you consider your current health and work ability: Do you believe that you will be working until retirement age?”), five answer options are given (1 = “sure”; 2 = “rather yes”; 3 = “unsure”; 4 = “rather not”; 5 = “in no case”). The values were dichotomized at the median, as proposed by the developers (35). As a consequence, agreement (answers 1 or 2) reflected a positive prognosis, uncertainty or disagreement (answers 3 to 5) indicated a poor prognosis (no missing accepted). Items 2 (“Do you consider your work ability permanently threatened by your health status?”) and 3 (“Do you consider an application for premature pension (due to ill-health)?”) are answered with “yes” or “no”, the latter indicating a positive prognosis (35, 37). The calculated sum-score ranges from 0 to 3 (no missing accepted) and was dichotomized into 0 (positive prognosis) versus 1 to 3 (poor prognosis).

Data analysis

Using IBM SPSS Statistics 25, we conducted Poisson regression analyses with the robust variance to estimate prevalence ratios (PRs) and corresponding 95% confidence intervals (CIs) (10). We defined high work engagement and low overcommitment as reference categories. Besides PRs adjusted for age and sex only, we computed multivariable PRs adjusted for age, sex, highest educational degree, body mass index (calculated from reported weight and height), and smoking status (never, current, former). All estimates are displayed in the tables, but only multivariable PRs are discussed in the text.

Results

Sample description

The final sample comprised 221 participants with asthma (response rate = 29.3%). Slightly more than half of the participants were women (53.8%). The mean age was 50.6 years. The educational level was fairly high, that is, more than 60% held a secondary school degree or higher. Less than one-third reported normal weight (body mass index < 25 kg/m²). Nearly half of the sample consisted of current or former smokers. Participants reported their work engagement and overcommitment to be at a midrange level. Nearly two-thirds suffered from uncontrolled asthma. The mean for asthma-specific quality of life was 4.4 (range: 0-10, lower values indicating better quality of life). As much as 60% of our sample reported a poor prognosis of gainful employment according to at least one item (out of three). Table 2 presents further characteristics of the sample.

[Please insert Table 2 around here.]

Work engagement and overcommitment and their associations with asthma self-management

In Table 3, we show estimates of the associations of work engagement and overcommitment with different domains of asthma self-management. In the multivariable model, physical activity (once a week or less) was related to work engagement: Employees with low work engagement had a higher prevalence of reporting to be physically inactive. Rehabilitants with low levels of work engagement or high levels of overcommitment had a up to doubled prevalence of reporting unfulfilled needs concerning trigger avoidance and acute symptom management. There were no significant relationships between work engagement or overcommitment and communication.

[Please insert Table 3 around here.]

Work engagement and overcommitment and their associations with asthma morbidity

As depicted in Table 4, neither work engagement nor overcommitment were meaningfully related to asthma control. However, employees with low work engagement showed a up to doubled – and participants with high overcommitment a up to three-fold elevated – prevalence of reporting low asthma-specific quality of life.

[Please insert Table 4 around here.]

Work engagement and overcommitment and their associations with the subjective prognosis of gainful employment

Table 5 shows estimates of the relationships between predictors and the subjective prognosis of gainful employment. Employees with asthma who reported low work engagement or high overcommitment had a higher prevalence (about one and a half times) of being uncertain or of not believing that they would be working until retirement age. Participants with low work engagement showed a up to doubled – and those with high overcommitment up to 2,5-fold elevated – prevalence of considering their work ability permanently threatened by their health status. The association of low work engagement with the consideration to apply for premature pension was rather strong (PRs ≈ 2), but of borderline statistical significance. There was no relationship between high overcommitment and considering an application for a premature pension. In total, employees with asthma who reported low work engagement or high overcommitment had a higher prevalence (about 1,5-fold) of a poor prognosis of their gainful employment.

[Please insert Table 5 around here.]

Discussion

Asthma self-management

Out of the different domains of asthma self-management, poor trigger avoidance and poor acute symptom management were related to low work engagement and high overcommitment. There was also an association between low work engagement and physical inactivity. No relationships could be found between the predictors and communication about one's asthma with colleagues and line-managers. Our observations highlight how work engagement may contribute to health-promoting behaviour among employees with asthma: Highly, but not overly committed employees with asthma may possibly be more likely to engage in self-management activities, because they are generally more active people (38) and put effort in what they are doing – whether it is their work or their asthma self-management at work. At the same time, those with pronounced work engagement might consider their health as equally or even more important than their work, which might be different among employees with high overcommitment: A review by Kärkkäinen et al. (39) showed that employees suffering from burnout showed higher odds (of borderline significance) of returning to work if they reported high overcommitment. To be able to work efficiently, both highly engaged and overcommitted workers might maintain good communication with colleagues and line-managers, which could be a reason why we did not find any difference in the associations with communication. Previous work suggested that psychosocial working conditions are related to asthma self-management (18). Our observations expand those findings by showing that cognitive, behavioural,

and emotional responses to these working conditions are also linked to asthma self-management, which may provide a mechanistic explanation for those earlier findings.

Asthma morbidity

In our study, there was no evidence of associations of work engagement and overcommitment with asthma control, but relationships with asthma-specific quality of life were found. The findings regarding overcommitment and asthma-specific quality of life are in agreement with observation from the prior study by Hartmann et al. (15). In contrast to Hartmann et al. (15), we did not find statistically significant associations when we examined overcommitment and asthma control. Additional studies, ideally among larger populations, are needed to clarify to what extent overcommitment relates to asthma control.

The subjective prognosis of gainful employment

Concerning the subjective prognosis of gainful employment, we found meaningful relationships between the predictors and the items as well as the sum-score, except for item 3. This is in line with our results for job decision latitude and support by colleagues and line-managers (19). Our previous results additionally showed that job satisfaction seems to mediate the association of the predictors and the subjective prognosis of gainful employment (19). Work engagement and social support were shown to be related to job satisfaction (40). Again, further research is needed to analyse the causal relationships between those variables and thus, to find the most effective approach to improve the subjective prognosis of gainful employment among employees with asthma.

Limitations of our study

Firstly, since this is a cross-sectional study, we were unable to gain insights into potential causality. Furthermore, the associations of work engagement and overcommitment with the outcomes might not be causal at all. For instance, it is conceivable that generally low activity levels might affect both work engagement and asthma self-management detrimentally. Secondly, like other studies among employees with chronic conditions, our results could be influenced by the healthy worker effect, which implies that chronically ill workers are more likely to quit the workforce (41) and which may influence job choices and selection processes during the career among individuals with asthma (42). However, by recruiting rehabilitants with asthma, we focused on a high-risk group – and thus, tried to limit possible bias due to the healthy worker effect. Additionally, we focused on a setting (i.e., PR), that could be one of the last through which patients with asthma whose gainful employment is endangered by their condition could be approached before they drop out of the workforce. The prevalence of uncontrolled asthma was quite high in our sample (65.6%), but comparable to the prevalences in other studies among patients who were diagnosed with asthma or received two or more prescriptions for asthma in the previous two years (43, 44). It thus seems that our sample does not differ markedly from other populations of people with asthma in terms of asthma control. However, by exclusively approaching patients in PR our results cannot be fully generalized to the whole group of asthma patients. Thirdly, we excluded employees with comorbid COPD according to their admission diagnoses. Since this condition is often confused with asthma (45), we cannot be fully certain that all diagnoses were correct. Lamentably, we were unable to check the discharge diagnoses for data security reasons. Fourthly, the response rate appears rather low (29.3%), but not unusual for studies among individuals with respiratory illnesses (46). Due to data security regulations, data on non-responders was limited to age and sex. Our sample comprised 52.8% women, which was comparable to the percentage in the entire group of patients in the time period of data assessment (55.6% women). Compared to the entire sample (range: 51.3-55.4 years in the three cooperating clinics), our sample was somewhat younger (mean: 50.6 years) though. Fifthly, we did

not obtain objective measures, e.g., to assess asthma self-management or asthma morbidity in terms of illness severity (e.g., peak expiratory flow or beta2 adrenergic receptor agonist use). Sixthly, a larger sample may have rendered a few more associations statistically significant, e.g., the relationship between overcommitment and communication. The effect size was similar to the association of overcommitment with trigger avoidance ($PR = 1.35$ vs. 1.32), but the CI was wider. Finally, it was beyond the scope of this study to examine the potential roles of additional psychosocial factors (e.g., mediation by mental health (47, 48)) related to the observed associations. Future research is needed to reproduce our findings and to address this gap.

Conclusions

Our results help to understand the relationships between responses to psychosocial working conditions and asthma outcomes. The potentially health-promoting effects of work engagement and the detrimental effects of overcommitment on asthma outcomes are highlighted by our study. By increasing work engagement and reducing or preventing overcommitment, employees with asthma might be better able to manage their condition adequately at work, to gain or maintain a good asthma-specific quality of life as well as a positive prognosis of their employability.

Given that prospective studies support our findings, interventions could be developed and implemented on the organizational level, because it was found that leadership styles interact with work engagement (49). Line-managers should serve as role models to change the company culture to ensure that employees can develop or maintain a health-promoting level of work engagement without suffering from the consequences of being excessively committed to their work on the long term.

Another promising approach to foster work engagement is to implement measures that are referred to as “new ways of working”, e.g., flexibility of the employees’ work schedule, their workplace, and their ways of communication, which were shown to improve work engagement and reduce exhaustion (50). The interviewees in our qualitative study (14) also stated that higher flexibility (or job decision latitude) would help them to self-manage their condition. The “new ways of working” add to our findings by broadening the aspects of the workplace that need to be more flexible from tasks and working time to working place and equipment. This is specifically interesting regarding the current, sudden, and dramatic modification of work arrangements due to the COVID-19 pandemic. The opportunity (or necessity) to work at home during the pandemic to reduce their risk of infection was particularly crucial for high-risk patients, e.g., employees with uncontrolled or severe asthma (51). The various consequences of week-long work at home are still to be investigated, e.g., concerning social isolation (52). A sustained re-arrangement of work, e.g., with increased flexibility and job decision latitude and thus, likely higher work engagement, could help to improve the situation for patients with asthma on the long-term. Admittedly though, not all employees with asthma will experience such benefits, e.g., if their occupational tasks allow for little flexibility and require physical presence at work.

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Declaration of interest

The authors report no conflict of interest.

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Table 1: Key variables used in this study

		Variable	Instrument	Number of items
Determinants		Work engagement	Copenhagen Psychosocial Questionnaire (20, 21), subscale: work engagement	3
		Overcommitment	Effort-Reward Imbalance Questionnaire (22, 25)	6
Outcomes	Asthma self-management	Physical activity	Item of the Survey of Health, Ageing and Retirement in Europe (26)	1
		Trigger avoidance	Self-constructed item (18)	1
		Acute symptom management	Self-constructed items (18)	7
		Communication	Self-constructed items (18)	2
	Asthma morbidity	Asthma control	Asthma Control Test (30, 31)	5
		Asthma-specific quality of life	Marks Asthma Quality of Life Questionnaire (32)	20
		Subjective prognosis of gainful employment (SPE)	SPE Scale (35, 36)	3

Table 2: Sample characteristics (n = 221)

Characteristic		Interpretation of values	
Age (years)			
	Mean (SD)	50.6 (8.7)	-
Sex			
	Women; n (%)	119 (53.8)	-
	Men; n (%)	102 (46.2)	-
Highest school degree			
	Lower than secondary school degree; n (%)	82 (37.1)	-
	Secondary school degree; n (%)	74 (33.5)	-
	Higher than secondary school degree; n (%)	62 (28.1)	-
Body mass index (BMI)			
	Underweight or normal (BMI < 25); n (%)	61 (27.6)	-
	Overweight (25 ≤ BMI < 30); n (%)	81 (36.7)	-
	Obese (BMI ≥ 30); n (%)	76 (34.4)	-
Smoking status			
	Never; n (%)	110 (49.8)	-
	Former; n (%)	96 (43.4)	-
	Current; n (%)	13 (5.9)	-
Work engagement ^a			
	Mean (SD)	58.8 (24.7)	Range: 0-100, higher values indicating higher level of work engagement
Overcommitment ^b			
	Mean (SD)	15.8 (3.9)	Range: 6-24, higher values indicating higher level of overcommitment
Physical activity			
	More than once a week; n (%)	144 (65.2)	-
	Once a week or less; n (%)	75 (33.9)	-
Trigger avoidance ^c			
	Mean (SD)	.6 (.5)	Range: 0 = fit of need and conditions vs. 1 = need unfulfilled
Acute asthma symptom management ^d			
	Mean (SD)	2.3 (2.0)	Range: 0 = fit of need and conditions to 7 = all needs unfulfilled
Communication ^e			
	Mean (SD)	.3 (.6)	Range: 0 = fit of need and conditions to 2 = both needs unfulfilled
Asthma control ^f			
	Controlled	76 (34.4)	-
	Not well controlled	145 (65.6)	-
Asthma-specific quality of life ^g			
	Mean (SD)	4.4 (1.8)	Range: 0-10, lower values indicating better quality of life
Work until retirement age			
	“sure” and “rather yes”; n (%)	94 (42.5)	-
	“unsure”, “rather not”, and “in no case”; n (%)	127 (57.5)	-
Work ability permanently at risk			
	No; n (%)	142 (64.3)	-
	Yes; n (%)	73 (33.0)	-
Consider applying for a pension			
	No; n (%)	192 (86.9)	-

Characteristic		Interpretation of values	
	Yes; n (%)	26 (11.8)	-
Sum-score of subjective prognosis of gainful employment ^h			
	Positive prognosis; n (%)	79 (35.7)	-
	Poor prognosis; n (%)	133 (60.2)	-

SD = standard deviation

^a measured by the Copenhagen Psychosocial Questionnaire (20, 21)

^b measured by the ERI questionnaire (22, 25)

^c measured by 1 self-constructed item

^d measured by 7 self-constructed items

^e measured by 2 self-constructed items

^f measured by the Asthma Control Test (30, 31),

range: 5-25, higher values indicating higher level of asthma control

^g measured by the Marks Asthma Quality of Life Questionnaire (32)

^h range: 0 to 3, 0 = positive prognosis, 1 to 3 = poor prognosis (according to at least one of three items)

Table 3: Prevalence ratios and 95% confidence intervals for different domains of asthma self-management according to work engagement and overcommitment (n = 221)

		Asthma symptom prevention								Acute asthma symptom management				Communication			
		Physical activity (once a week or less)				Trigger avoidance (unfulfilled need)				(unfulfilled needs)				(unfulfilled needs)			
		Adjusted for age and sex		Multivariable model ^a		Adjusted for age and sex		Multivariable model ^a		Adjusted for age and sex		Multivariable model ^a		Adjusted for age and sex		Multivariable model ^a	
		PR	95% CI	OR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
WE ^b																	
	High	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-
	Low	1.41	.97-2.05	1.56	1.09-2.24	1.55	1.27-1.89	1.53	1.25-1.87	2.00	1.12-3.57	1.94	1.10-3.41	1.49	0.84-2.64	1.48	0.84-2.61
OC ^c																	
	Low	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-
	High	1.13	.77-1.66	1.17	.81-1.7	1.34	1.09-1.65	1.32	1.07-1.63	1.89	1.03-3.46	1.87	1.02-3.44	1.37	.78-2.39	1.35	.78-2.34

PR = prevalence ratio; CI = confidence interval, WE = work engagement; OC = overcommitment

^a adjusted for age, sex, highest educational degree, body mass index, and smoking status

^b dichotomized at the tertile: high work engagement = reference group; low work engagement = high-risk group (bottom tertile)

^c dichotomized at the tertile: low overcommitment = reference group; high overcommitment = high-risk group (top tertile)

Table 4: Prevalence ratios and 95% confidence intervals for asthma control and asthma-specific quality of life according to work engagement and overcommitment (n = 221)

		Asthma control				Asthma-specific quality of life			
		Adjusted for age and sex		Multivariable model ^a		Adjusted for age and sex		Multivariable model ^a	
		PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
WE ^b									
	High	Ref.	-	Ref.	-	Ref.	-	Ref.	-
	Low	1.17	.97-1.42	1.21	0.999-1.48	1.93	1.32-2.80	1.85	1.27-2.68
OC ^c									
	Low	Ref.	-	Ref.	-	Ref.	-	Ref.	-
	High	1.15	.95-1.4	1.16	.96-1.41	2.85	1.90-4.26	2.82	1.90-4.19

PR = prevalence ratio; CI = confidence interval; WE = work engagement; OC = overcommitment

^a adjusted for age, sex, highest educational degree, body mass index, and smoking status

^b dichotomized at the tertile: high work engagement = reference group; low work engagement = high-risk group (bottom tertile)

^c dichotomized at the tertile: low overcommitment = reference group; high overcommitment = high-risk group (top tertile)

Table 5: Prevalence ratios and 95% confidence intervals for subjective prognosis of gainful employment according to work engagement and overcommitment (n = 221)

		Work until retirement age (uncertainty to disagreement)				Work ability permanently at risk (yes)				Consider applying for a pension (yes)				Sum-score (0 vs. rest = poor prognosis)			
		Adjusted for age and sex		Multivariable model ^a		Adjusted for age and sex		Multivariable model ^a		Adjusted for age and sex		Multivariable model ^a		Adjusted for age and sex		Multivariable model ^a	
		PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
WE ^b																	
	High	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-
	Low	1.53	1.24-1.89	1.56	1.26-1.93	1.74	1.20-2.50	1.74	1.19-2.53	2.04	1.02-4.09	2.10	.99-4.45	1.40	1.15-1.71	1.42	1.17-1.73
OC ^c																	
	Low	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-	Ref.	-
	High	1.47	1.18-1.84	1.46	1.18-1.82	2.45	1.67-3.59	2.44	1.66-3.61	1.30	.61-2.76	1.25	.58-2.72	1.52	1.25-1.85	1.52	1.25-1.85

PR = prevalence ratio; CI = confidence interval, WE = work engagement; OC = overcommitment

^a adjusted for age, sex, highest educational degree, body mass index, and smoking status

^b dichotomized at the tertile: high work engagement = reference group; low work engagement = high-risk group (bottom tertile)

^c dichotomized at the tertile: low overcommitment = reference group; high overcommitment = high-risk group (top tertile)