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ABSTRACT. ***Objective.*** To explore the effect of health-related and contextual factors on presenteeism, absenteeism, and overall work productivity loss in patients with active ankylosing spondylitis (AS).

Methods. Consecutive patients with AS starting their first tumor necrosis factor inhibitor and in paid employment were eligible. Patients completed the Work Productivity and Activity Impairment (WPAI) questionnaire for AS to assess presenteeism, absenteeism, and overall work productivity loss in the previous 7 days. In addition, they answered questions about work characteristics (type, characteristics of workplace, satisfaction of contacts with colleagues, and importance of work in life) and health status [Bath AS Functional Index (BASFI), AS Disease Activity Score-C-reactive protein (ASDAS-CRP)]. Physicians assessed the Bath Ankylosing Spondylitis Metrology Index, presence of articular and extraarticular manifestations, comorbidities, and laboratory indicators of inflammation. Stepwise regression models were computed to determine which work-related and health-related factors contributed to WPAI outcomes.

Results. The study included 80 patients. The WPAI presenteeism, absenteeism, and overall work productivity loss scores were 49.1%, 30.2%, and 53.1%, respectively. Presenteeism was associated with higher BASFI, female sex, and poor quality of contact with colleagues. Absenteeism was associated with increasing age, current smoking status, higher ASDAS-CRP, and low importance of work for life. Overall work productivity loss was associated with female sex, higher BASFI, past adaptation of job because of illness, number of working hours, and manual profession.

Conclusion. Both health-related and contextual factors contribute to work limitations in patients with AS and suggest additional opportunities for improvement by addressing the working environment. (First Release Nov 1 2014; J Rheumatol 2015;42:93–100; doi:10.3899/jrheum.131287)

Key Indexing Terms:
ANKYLOSING SPONDYLITIS WORK ABSENTEEISM

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Ankylosing spondylitis (AS) is a chronic inflammatory rheumatic disease that affects the axial skeleton, but can also involve peripheral joints or tendons, as well as other organs such as eye, bowel, and skin[1]. The symptoms related to articular as well as extraarticular manifestations can lead to impaired functioning and a reduction in the patient's health-related quality of life[2]. Because of the effects of AS, patients may have problems in their ability to adjust to the different demands of their job, which can lead to impairments while at work (presenteeism), sick leave (absenteeism), and eventual withdrawal from the labor force[3]. Patients with AS are more likely to be unemployed compared with the general population[4,5,6].

In patients with paid work, insights into the effects of AS on presenteeism, absenteeism, and overall work productivity are limited. The majority of studies addressing these work outcomes have either described the magnitude of the problem in unselected patients or assessed the effect of tumor necrosis factor inhibitors (TNFi) on productivity in intervention trials[4,5,6,7,8,9,10,11,12,13,14]. Fewer studies have

explored the factors that contribute to presenteeism or sick leave. In such studies, the effect of AS on the biomedical aspects of the disease received attention, and these studies suggested a clear association between limitations in physical function and presenteeism, absenteeism, and work productivity[7,12,15]. However, in accordance with the International Classification of Functioning, Disability, and Health model, the role contextual factors play in work outcomes is increasingly recognized[16,17]. Also, the Outcome MEasures in Arthritis Clinical Trials explicitly highlights the relevance of contextual factors in the recently proposed framework selection of core outcomes and core measures[18]. A large number of candidate contextual factors (either environmental or personal) exist when addressing work outcomes[19]. To date, there is no consensus on which contextual factors have a relevant effect on these outcomes, independent of health-related variables.

The objective of our study was to explore the effect of a large number of work-related variables in addition to health-related factors on presenteeism, absenteeism, and overall work productivity loss in patients with AS eligible for TNFi treatment.

MATERIALS AND METHODS

Study design. Ours is a prospective, multicenter, open-label, post-authorization, observational study in Belgian patients with AS, focusing on the effects of etanercept (ETN) on work productivity (clinicaltrials.gov NCT01421303). The analyses of our present study are based on the baseline data available at the end of the 1-year patient inclusion period.

Patients. To be eligible, patients were required to be ≥ 18 years old; have active disease (as judged by their rheumatologist), and be eligible for ETN treatment following the Belgian reimbursement criteria. They also had to be employed, capable of understanding and willing to provide signed informed consent, and capable of understanding and completing questionnaires. To meet the Belgian reimbursement eligibility criteria, patients were required to meet the modified New York criteria for the diagnosis of AS, have failed conventional therapy for AS, and to have all of the following: a Bath AS Disease Activity Index (BASDAI) score of ≥ 4[20], a C-reactive protein (CRP) value higher than the upper limit of normal, an inadequate response to 2 or more nonsteroidal antiinflammatory drugs (NSAID) for at least 3 months, absence of active or latent tuberculosis, and a prescription for TNFi treatment from a board-certified rheumatologist. Exclusion criteria included patients who had already initiated a procedure for work disability/pension, previous use of TNFi either in commercial use or in a study for the treatment of AS or a related spondyloarthropathy condition, and history of or current psychiatric illness that would interfere with the patient's ability to comply with protocol requirements or give consent (judged by the treating rheumatologist).

Assessments. The factors used in our study that contribute to presenteeism, absenteeism, and overall work productivity loss follow the biopsychosocial model proposed by the International Classification of Functioning, Disability, and Health model (Figure 1). This model recognizes the importance of health-related and work-related or personal factors for at-work productivity loss and sick leave.

Questionnaires. Patients completed the Work Productivity and Activity Impairment (WPAI) questionnaire, which evaluated presenteeism, absenteeism, and overall work productivity loss[21]. The WPAI-AS asks for the number of hours missed because of AS-related health in the last week (Q2a), the number of hours missed for other reasons (Q2b), the number of hours actually worked (Q3), and the effect of AS on productivity (0–10 scale, 10 = maximal effect on productivity) while at work (Q4). Impairment while working because of problems (presenteeism) was calculated as Q4 ÷ 10; work time missed because of problems (absenteeism) as Q2a ÷ (Q2a + Q2b + Q3); and overall work productivity loss because of problems as:

$$[Q2a \div (Q2a + Q2b + Q3)] + [1 - (Q2a) \div (Q2a + Q2b + Q3)] \times Q4 \div 10.$$

All quantities were multiplied by 100 to be expressed as percentages. The question on activity impairment in nonpaid work was not considered in the present analyses. To understand the absence over a longer period of time, patients were also asked the number of working days they missed because of AS in the past 3 months.

In addition to the WPAI-AS, patients reported on a number of personal characteristics such as age, sex, educational level (finished primary or lower professional school only/finished middle professional or secondary school/finished higher professional school or university), and importance of their work for their life (numerical rating scale 0–1, 10 = very important). Patients also answered questions on a large number of job- and work-related environmental factors. First, patients completed an open question on their current profession, which was classified for further analyses into manual jobs and nonmanual jobs. Second, patients were asked whether, in the past, changes in their job were made because of their disease (yes/no). In addition, they answered questions on job control and autonomy (level at which I can plan work myself, work can be postponed, work offers possibility for personal development; on a 4-point scale), workplace characteristics (no. colleagues doing the same work, quality of contact with colleagues; 0–10 scale, 10 very good), employer knows about illness (no/yes and takes illness into account/yes, but does not take illness into account), and job characteristics [irregular working hours and shift work (yes/no), no. employees doing the same work (< 50, 50–200, > 200)]. All questions on job and job characteristics (except the questions on job changes because of disease and awareness of employer about illness) were part of the Module Profession and Job of the PROductivity losses in DISability Questionnaire (PRODISQ), a modular and validated questionnaire on work[22].

Finally, biomedical aspects of disease were assessed through a series of questionnaires or assessments. In addition to disease duration since symptom onset and since diagnosis, the following disease activity and functioning assessments had to be completed by patients or physicians: physician global assessment (PGA), Bath AS Functional Index (BASFI)[23], BASDAI, Ankylosing Spondylitis Disease Activity Score [ASDAS; both CRP and erythrocyte sedimentation rate (ESR) methods][24], Bath AS Metrology Index (BASMI)[25,26,27], and Bath AS Patient Global Score (BAS-G)[28]. The treating physician indicated whether patients had currently or ever experienced AS-related extraspinal disease or extraarticular manifestations [anterior uveitis, cardiac involvement, lung involvement, psoriasis, peripheral joint involvement (excluding hip and shoulder), hip or shoulder involvement, inflammatory bowel disease (IBD), or other gastrointestinal involvement], or ever had any AS-related surgery [total knee, hip, shoulder, and elbow replacements (unilateral and bilateral), wrist/hand/ankle/foot surgery, or spinal surgery].

Statistical analyses. Quantitative data were summarized as mean and SD, or as median and interquartile range (IQR) for skewed distributions. Normality was assessed by the Shapiro-Wilk test. Frequency tables were used for categorical variables. Regression analysis was used to test the effect of each individual health-related and contextual factor on presenteeism, absenteeism, and overall work productivity loss (as measured using the WPAI-AS questionnaire). Then all factors related to any of the 3 specific outcomes of interest at the "$p < 0.10$ level" were processed into a multivariate stepwise regression analysis for each outcome with both entry and removal acceptance levels set at $p = 0.05$. Classical linear regression analysis was used for presenteeism and overall work productivity loss, which followed a normal distribution. In contrast, absenteeism displaying a U-shape distribution was converted into a categorical variable (0%

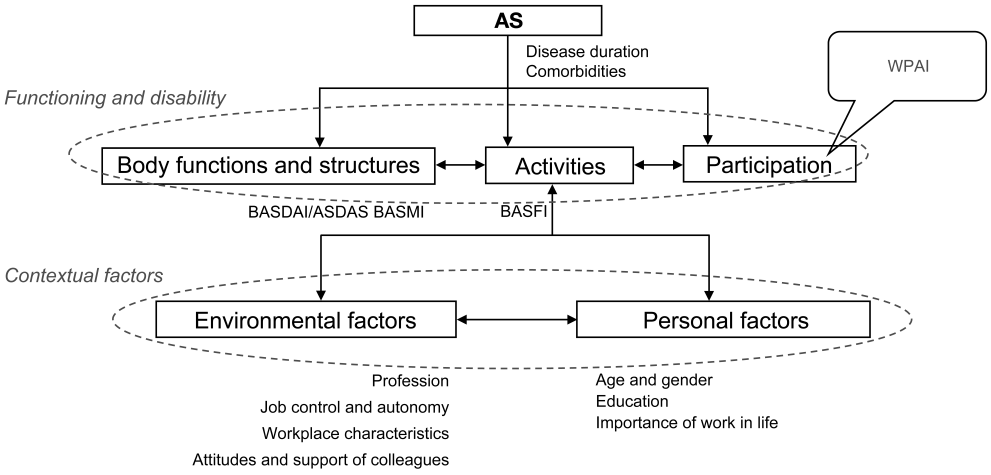

Figure 1. Framework representing the biopsychosocial model of the International Classification of Functioning, Disability and Health in which the target variable (participation, measured by the WPAI questionnaire) and the exploratory variables that are used in the present analyses are indicated[16]. AS: ankylosing spondylitis; ASDAS: Ankylosing Spondylitis Disease Activity Score; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; BASFI: Bath Ankylosing Spondylitis Functional Index; BASMI: Bath Ankylosing Spondylitis Metrology Index; WPAI: Work Productivity Activity Index.

absence, 1–99%, and 100%) and analyzed by ordinal logistic regression. Results were reported as regression coefficients with standard error. The quality and strength of the regression was assessed by the multiple coefficient of determination R^2 and by the area under the curve (AUC) for ordinal logistic regression. Statistical significance was set at the 5% critical level ($p < 0.05$). All calculations were done with SAS (version 9.3 for Windows, SAS Institute) and S-PLUS (version 8.1, TIBCO Software Inc.) statistical packages.

RESULTS

Demographics and disease characteristics. A total of 80 patients were screened and all were eligible for inclusion in the study. Demographics and disease characteristics are listed in Table 1. An equal proportion of male and female patients were involved in the study. Median duration of disease was 9.4 years since the first symptoms and 1.6 years since diagnosis. The majority of patients (87.5%) were currently receiving NSAID to treat their AS. Disease activity was generally high with a mean BASDAI score above the ≥ 4 cutoff that treatment guidelines use as a factor to determine eligibility for TNFi treatment, and also ASDAS-CRP/ESR levels pointed toward high disease activity. Thirty patients (37.5%) had experienced either extraspinal disease or extraarticular manifestations, and 15.1% presented comorbidities. Five patients (6.3%) had undergone 1 or more AS-related surgical procedures: 1 patient (1.3%) had a unilateral total hip replacement, 1 (1.3%) had a unilateral total shoulder replacement, 1 (1.3%) received wrist/hand/ankle/foot surgery, and 2 (2.5%) had undergone spinal surgery.

Job characteristics. Information about the patients' work life obtained from the work questionnaire is presented in Table 2. Forty-two patients (53.2%) achieved a high education level. The median working time since the first paid job was 17 years, and only a minority of patients (13.9%) changed jobs because of their illness. Twenty-one patients (26.6%) made or received adaptations to their work because of AS. The median number of hours worked was 38 per week, over 5 days per week. The majority of patients (59.0%) had a manual profession. The largest proportions of patients were considered employees (39.2%) or workers (38.0%). Twenty-one patients (26.6%) indicated that they could never organize their work themselves, 60.3% could never postpone the execution of their work, and 16.9% could never develop their skills in their job. Quality of contact with colleagues was high (median 8.0, IQR 7–9). Of the patients whose employers knew about their illness, 66.0% of them took it into account and 34.0% did not. Patients considered work to be important for their life with a median score of 8 (IQR 7–9).

Effect of AS on work productivity. The WPAI-AS presenteeism and absenteeism scores were 49.1% (SD 22.9) and 30.2% (SD 40.6), respectively, leading to a WPAI-AS overall worker productivity loss of 53.1% (SD 25.7). Absenteeism was reported as 0% by 38 patients, between 1 and 99% by 16 patients, and 100% by 13 patients. When the recall period was extended to the past 3 months, 44.3% of patients reported an absence from work with a median of 10 days (IQR 8–25). Considering the exact number of work days per week reported by the patients, the median percentage of missed work days over the past 3 months amounted to 15.4% (IQR 9.9–38.5), which was lower than the estimates based on the WPAI. When categorizing the number of days absent because of AS in the last 3 months

Table 1. Demographics and disease characteristics. Quantitative data are presented as mean (SD) or median (IQR).

Characteristic	n = 80
Age, yrs	38.1 (9.1)
Male sex, n (%)	40 (50.0)
Disease duration, yrs	
Symptoms	9.4 (4.6–15.5)
Diagnosis	1.6 (0.3–9.1)
Smoking status, n (%)	
Current smoker	32 (40.5)
Ex-smoker	17 (21.5)
Non-smoker	30 (38.0)
Current medication, n (%)	
Methotrexate	4 (5.0)
Sulfasalazine	10 (12.5)
Corticosteroids	3 (3.8)
NSAID	70 (87.5)
Comorbidities, n (%)	
1	7 (8.8)
2	4 (5.0)
3	1 (1.3)
Systemic features, n (%)	
Anterior uveitis	7 (8.8)
Psoriasis	9 (11.3)
Peripheral joint involvement	12 (15.0)
Hip involvement	8 (10.0)
Shoulder involvement	6 (7.5)
GI involvement: IBD	2 (2.5)
GI involvement: other	1 (1.3)
AS-related surgery, n (%)	
Unilateral hip replacement	1 (1.3)
Unilateral total shoulder replacement	1 (1.3)
Wrist/hand/ankle/foot surgery	1 (1.3)
Spinal surgery	2 (2.5)
ESR, mm/h	15.5 (8–26)
CRP, mg/l	8.4 (3.5–19.3)
PGA	7 (5–8)
BASMI	2.8 (1.4)
BASFI	5.1 (2.0)
BASDAI	6.0 (1.7)
ASDAS-CRP	3.6 (0.8)
ASDAS-ESR	3.3 (0.8)
BAS-G	6.9 (1.5)
WPAI, %	
Absenteeism	0 (0–57.9)*
Impairment, presenteeism	49.1 (22.9)
Work productivity loss	53.1 (25.7)
Activity impairment	70 (50–80)
Patients with sick leave, %	29 (43.3)
Length of sick leave in the 7 last days, hours	0 (0–30)

* Mean (SD) absenteeism (%): 30.2 (40.6). IQR: interquartile range; NSAID: nonsteroidal antiinflammatory drug; GI: gastrointestinal; IBD: inflammatory bowel disease; AS: ankylosing spondylitis; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; PGA: physician global assessment; BASMI: Bath Ankylosing Spondylitis Metrology Index; BASFI: Bath Ankylosing Spondylitis Functional Index; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; ASDAS: Ankylosing Spondylitis Disease Activity Score; BAS-G: Bath Ankylosing Spondylitis Global Score; WPAI: Work Productivity Activity Index.

Table 2. Profession and work situation. Quantitative data are presented as mean (SD) or median (IQR).

Question	n = 80
1) Time since first paid job*, yrs	17 (9–23)
2) Change job because of illness, yes (%)	11 (13.9)
3) Were there some adaptations of your job because of your illness? Yes, n (%)	21 (26.6)
4) Manual profession, yes (%)	46 (59.0)
5) How many hours per week are you working?	38 (35–40)
6) How many days per week are you working?	5 (5–6)
7) What is your highest diploma? n (%)	
Primary school	1 (1.3)
Lower professional school	13 (16.5)
Secondary school	23 (29.1)
Higher education school	32 (40.5)
University degree	9 (11.4)
Postgraduate education	1 (1.3)
8) Can you organize your work yourself? Yes, n (%)	
Never	21 (26.6)
Sometimes	28 (35.4)
Often	16 (20.3)
Always	14 (17.7)
9) Can you postpone the execution of your work? Yes, n (%)	
Never	47 (60.3)
Sometimes	29 (37.2)
Often	2 (2.6)
Always	0 (0.0)
10) Is it possible for you to develop your skills in your job? Yes, n (%)	
Never	13 (16.9)
Sometimes	30 (39.0)
Often	23 (29.9)
Always	11 (14.3)
11) Among your colleagues, how many are doing the same job (or comparable) as yours?	5 (2–12)
12) Give an estimation of the quality of the contacts with your colleagues in your actual position. (0 = very bad to 10 = very good)	8 (7–9)
13) Does your employer know about your illness? n (%)	
No	25 (33.3)
Yes he/she does take it into account	33 (44.0)
Yes he/she does not take it into account	17 (22.7)
14) Are you working with an irregular schedule or with pauses? Yes, n (%)	26 (32.9)
15) Do you manage staff? Yes, n (%)	20 (25.3)
16) How many workers are there in your enterprise? Yes, n (%)	
< 50	36 (45.6)
50–200	10 (12.7)
> 200	33 (41.8)
17) Which kind of work are you doing? Yes, n (%)	
Worker	30 (38.0)
Employee	31 (39.2)
State employee	6 (7.6)
Independent	11 (13.9)
State employee + independent	1 (1.3)
18) Do you need to travel by car for your job (taking into account the travel home–work)? Yes, n (%)	49 (62.0)
19) During the last 3 months, did you have 1 or more absences at work?	
Yes, n (%)	35 (44.3)
No. days	10 (8–25)
20) In terms of quality of life, what importance is given to your job? (0 = not very important to 10 = very important).	8 (7–9)

* For Question 1, patients were asked the year of their first job and this was used to calculate the time since first paid job. IQR: interquartile range.

(no absence, between 1 and 60 days absent, and the maximal number of days absent), a moderate agreement was found with the categorized absenteeism based on WPAI (Cohen κ 0.45, 95% CI 0.27–0.64)[29].

Health-related and contextual factors associated with presenteeism, absenteeism, and overall work productivity loss. Univariate regression analyses revealed that 21 variables were associated at the $p < 0.10$ level with presenteeism, absenteeism, or overall work productivity loss: age, sex, disease duration, number of comorbidities, current smoker, past smoker, PGA, BASFI, BASDAI, ASDAS-CRP, ASDAS-ESR, BASMI, BAS-G, adaptation of job to illness, manual profession, number of hours worked/week, education, quality of contacts with colleagues, employer knows about illness and accounts for it, employer knows about illness but does not account for it, and importance of job for life. Only these covariates were included in the stepwise regression analyses that led to the final models reported in the following sections (Table 3).

Presenteeism. Presenteeism was lower in men than in women ($p = 0.0027$) and increased significantly ($p < 0.0001$) with BASFI. Presenteeism also decreased with the quality of contact with colleagues ($p = 0.0096$).

Absenteeism. The final ordinal model (AUC = 0.80) showed that assessed absenteeism increased with age ($p = 0.033$) and ASDAS-CRP ($p = 0.0062$), and was higher among current smokers ($p = 0.0045$). By contrast, it decreased with the importance of job for life ($p = 0.0047$). When repeating the analyses for work days absent in the past 3 months with the same patients, stepwise regression showed that age (0.15 ± 0.049, $p = 0.023$) and BAS-G (0.85 ± 0.30, $p = 0.0052$) were the only significantly related factors (AUC = 0.82).

Overall work productivity loss. Overall work productivity loss was lower in men ($p = 0.0002$) and higher in persons who did manual work ($p = 0.022$), in those who adjusted their job in the past because of their disease ($p = 0.0009$), and in persons who worked more hours per week ($p = 0.0045$). Increasing limitations in physical function (BASFI) were strongly associated with overall work productivity loss ($p < 0.0001$).

Table 3. Effect of health and contextual factors on presenteeism, absenteeism, and overall work productivity loss: final multivariate models after stepwise variable selection.

Variable	Coefficient (SE)	p
Presenteeism, n = 50, $R^2 = 0.56$		
Intercept	56.5 (13.7)	
Male sex	–14.6 (4.60)	0.0027
BASFI	6.87 (1.22)	< 0.0001
Quality of contact	–4.16 (1.54)	0.0096
Absenteeism, n = 65, AUC = 0.80*		
Intercept 1	–4.18 (2.66)	
Intercept 2	–2.55 (2.63)	
Age	0.071 (0.033)	0.033
Current smoker	1.70 (0.60)	0.0045
ASDAS-CRP	1.11 (0.41)	0.0062
Importance of job in life	–0.65 (0.23)	0.0047
Overall work productivity loss, n = 49, $R^2 = 0.63$		
Intercept	–73.6 (5.09)	
Male sex	–20.5 (5.09)	0.0002
BASFI	6.33 (1.35)	< 0.0001
Adaptation of job due to illness, yes	18.7 (5.23)	0.0009
Profession, manual	12.0 (5.04)	0.022
No. hours worked per week, log	25.6 (8.56)	0.0045

* Ordinal logistic regression. BASFI: Bath Ankylosing Spondylitis Functional Index; ASDAS-CRP: Ankylosing Spondylitis Disease Activity Score–C-reactive protein.

DISCUSSION

To the best of our knowledge, no study has investigated a comprehensive set of work-related contextual factors and their effect on absenteeism, presenteeism, and overall work productivity loss in patients with active AS who have a paid job. We have shown that, in addition to disease-related factors such as BASFI or ASDAS-CRP, several contextual factors composing "appraisal-based" variables, such as quality of contact with colleagues and importance of work for life as well as objective measures such as type of profession and adaptations of job, were associated with work productivity in patients with active AS.

The interest in presenteeism and absenteeism is increasing because they are relevant outcomes by themselves and also because they can be indicators for future work disability[3,10]. Patients in our study incurred substantial loss in self-reported work productivity during the week preceding the start of TNFi; presenteeism because of AS was 49.1% and absenteeism because of AS was 30.2%, resulting in an overall work productivity loss of 53.1%. This was comparable with baseline data from the Adalimumab Trial Evaluating Long-Term Efficacy and Safety in AS (ATLAS) study in patients starting biological treatment[12]. In the ATLAS trial (n = 205 working patients), scores of 41.7% for presenteeism and 43.9% for overall work impairment were similar to those reported here; however, a much lower value of 9.0% for absenteeism was recorded. Other studies among patients initiating biological treatment used different scales to measure work outcomes, therefore hampering direct comparisons[7,8,30].

The association between disease-related factors and presenteeism or absenteeism was also shown in several other studies. In an unselected group of patients under the care of rheumatologists (n = 72 working patients), age, BASFI, and BASDAI were found to be associated with presenteeism, but only BASFI was previously associated with absenteeism[15]. A study evaluating 612 patients with AS (n = 315 in employment) within UK rheumatology centers found that BASDAI but also depression were associated with absenteeism, and disease activity, depression, anxiety, and self-efficacy played a role in presenteeism[31]. Among

patients eligible for treatment with TNFi in a clinical trial setting, a multivariate model in the ATLAS trial (n = 194 patients with paid work were analyzed) showed that physical functioning (BASFI) was moderately and significantly associated with presenteeism, and that BASDAI was only weakly yet significantly associated with presenteeism[12]. In the Ankylosing Spondylitis Study for the Evaluation of Recombinant Infliximab Therapy trial (n = 279 patients for the entire study cohort; 58% of them were employed), BASFI was significantly associated with productivity (at work, school, or home), using Spearman correlation coefficients to examine factors[7]. In our study, the different effects observed for the role of limitations in physical function (BASFI was associated with presenteeism and overall work productivity loss, but not absenteeism) and disease activity (ASDAS was associated with absenteeism, but not presenteeism or overall work productivity loss) cannot be easily explained. Our data suggest that the level of disease activity has a greater influence on the decision of patients to stay at home, while the level of physical limitations has a stronger independent influence of productivity while at work. Interestingly, when exploring determinants of days absent in the last 3 months, only age and BAS-G were significant. It is not surprising that disease activity (or other reported health outcomes) measured at the time of the survey was unrelated to past sick leave that occurred up to 3 months before. BAS-G, on the other hand, includes the global well-being because of AS in the past 6 months.

The role of contextual factors in relation to work disability in AS has been reported in a number of previous studies that revealed the nature of work (workload), workplace support (such as contact with colleagues or supervisors), work adaptations, and personal behavior (coping) were associated with work disability[6,31,32,33,34,35,36,37,38,39,40]. However, the role of contextual factors in relation to absenteeism was the focus of only 4 studies[13,40,41,42], and no study has explored their effect on presenteeism. Grazio, *et al* found the nature of the work to be associated with sick leave[41] and Guillemin, *et al* found that the exposure to cold conditions and prolonged standing postures showed a higher relative risk of longterm sick leave[42]. Ward and Kuzis could not confirm a relationship between physically demanding jobs with a decrease in work hours or longterm sick leave[40]. When considering disease-related variables and environmental factors together, Boonen, *et al* showed in a 3-nation study (France, Belgium, and the Netherlands) that manual jobs, independent of BASFI, were associated with episodes of absenteeism[13]. In addition, the length of sick leave was higher for those living in the Netherlands (which could be because of the differences in the organization of the social security system), patients with IBD, and BASDAI. It must be noted that the majority of the existing studies were performed over 10 years ago and in older patients than in our study. Interestingly, we demonstrated that "appraisal-based" factors, such as importance of work for life and quality of contact with colleagues, protected against adverse work outcomes, while objective measures such as the number of working hours and manual jobs increased the likelihood for restrictions in labor force participation. Different contextual factors were associated with the different work outcomes, which could be due to the small number of patients (and events when addressing absenteeism) influencing significance levels, and therefore, the decision to include or exclude some variables when computing the models.

Our present study has some other limitations that need to be highlighted. Patients from only 1 country were observed and this might influence the generalizability of the study. For example, countries have different social security systems and different work-related factors that might affect work outcome. Also, the higher number of female patients suggests some patients might have had nonradiographic axial spondyloarthritis (nr-axSpA) rather than AS. Based on the Belgian reimbursement criteria used for inclusion in our study, patients with nr-axSpA should not have been included; however, radiographs to verify this were not available. We trusted the investigators' diagnoses of active AS. It must also be noted that the study patients were highly selected in that they had high enough disease activity to warrant TNFi therapy, but were still able to work. The cross-sectional nature of the study did not allow for determining significant factors that also predict adverse work outcome. Although we found that the effect of poor quality of contact with work colleagues was related to presenteeism, no information was collected on whether these colleagues held a more senior position to the patients, were their peers, or were junior staff. It is important to note that the knowledge and concern about illness by employer played no independent role with regard to work outcome. Lastly, while we already assessed a large number of work-related factors, generic measures of coping or self-efficacy were not measured, and it remains unknown to what extent they would have had an independent contribution.

Because not all potential contextual factors have been explored in relation to work outcome and their independent role is still conflicting, we think there is insufficient evidence to make a firm recommendation to which contextual factors should be included in work studies as an outcome. Moreover, it seems that contextual factors that are important for absence from work and presenteeism may be different from predictors for withdrawal from work.

This analysis of patients in paid employment with active AS found that BASFI, female sex, and quality of contact with colleagues were significantly associated with presenteeism, and that the patient's age contributed significantly to absenteeism. Our data suggest that the interactions with colleagues should receive more attention when assessing the problems or restrictions in work productivity of patients

with active AS. The followup at 6 and 12 months after ETN treatment of the present cohort will provide longitudinal data and further insights.

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