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**EMPLOYMENT AND OCCUPATIONAL OUTCOMES OF WORKERS WITH  
MUSCULOSKELETAL PAIN IN A FRENCH REGION**

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## **Abstract**

**Objectives:** To study the employment and occupational outcomes of workers who were diagnosed with upper limb musculoskeletal disorders (UL-MSDs) or had complained of upper limb musculoskeletal pain a few years before, compared to workers who had no upper limb pain.

**Methods:** In 2002-2005, an epidemiological surveillance system was set up. Occupational physicians examined 3 710 randomly selected workers. It focused on six UL-MSDs: rotator cuff syndrome, lateral epicondylitis, flexor- extensor peritendinitis of the hands and fingers, De Quervain's disease, carpal tunnel syndrome and ulnar tunnel syndrome. Three groups were constituted: a "UL-MSD" group (workers with a clinically diagnosed UL-MSD at baseline, 13% of the cohort); a "PAIN" group (workers with pain in the previous seven days at baseline and without any clinically diagnosed form, 38%); and a "HEALTHY" group (workers with no disorder or upper limb pain in the previous seven days, 49%). They completed a questionnaire between 2007 and 2009.

**Results:** A total of 2 332 responded. Fewer subjects were still in work in the "UL-MSD" group (79.3%) than in the "PAIN" (85.9%) and "HEALTHY" (90.4%) groups, the difference remaining significant after adjusting for gender, age, occupational category, type of company and comorbidities. Of the subjects still in work, 24% had changed their work station in the same company in the "PAIN" group, compared to 19% in the "HEALTHY" group and 21% in the "UL-MSD" group.

**Conclusions:** This study showed the impact of musculoskeletal pain on employment outcome and the difficulty of keeping workers with musculoskeletal problems at work.

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## **WHAT THIS PAPER ADDS**

### **What is known**

Only a few studies have quantified the influence of musculoskeletal pain and MSDs on work status. One study showed that one third of French workers had not returned to work in the same company two years after acceptance of their compensation claims for upper limb MSDs (UL-MSDs).

### **What this study adds**

One significant result was that subjects with upper limb pain at baseline had more often ceased working at the second point, 1.5 times more often than the subjects without upper limb pain at baseline. The second significant result was that twice as many workers with a previously diagnosed UL-MSD declared they had ceased work at the second point, compared to the subjects without upper limb pain at baseline.

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## **INTRODUCTION**

Musculoskeletal disorders (MSDs) are a major occupational health problem and the main cause of sickness absence from work in France. (1). It is accepted that MSDs have a significant impact on people's ability to work. However, only a few studies have quantified the influence of musculoskeletal pain and MSDs on work status. One study showed that one third of French workers had not returned to work in the same company two years after acceptance of their compensation claims for upper limb MSDs (UL-MSDs) (2). Although compensation claims are the main source of information about UL-MSDs in France, they underestimate the extent of UL-MSDs in the workforce. French occupational physicians (OPs) can provide wider information about the influence of health status on the occupational status in the general working population. All salaried workers in France (including temporary and part-time workers), undergo a regularly-scheduled mandatory health examination, whether they complain about health problems or not. It is conducted by an OP in charge of the medical surveillance of a group of companies.

The aim of this article is to describe and quantify the occupational consequences of upper limb musculoskeletal pain reported in a sample of French workers randomly selected by OPs by studying the employment and occupational outcomes of workers with these disorders or with upper limb musculoskeletal pain a few years before, compared to a reference group without upper limb pain at that time.

## **METHODS**

### **Study population**

This prospective study was based on two successive surveys of a large sample of workers in the French Pays de la Loire region. This region contains 5.6% of the French working population and its diversified socioeconomic structure is close to that of France as a whole.

Between 2002 and 2005, 83 OPs (18% of OPs in the region) volunteered to participate in this study. They were representative of the region's OPs in terms of working time and

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geographic and economic sectors covered (3). For the first survey that was conducted between 2002 and 2005, they randomly selected 3 710 workers aged 20 to 59 years from those undergoing their mandatory annual examination, following a two-stage sampling procedure. First, the research team chose 15–30 half-days of scheduled examinations for each OP. Next, using random sampling tables, each OP selected 1 out of 10 workers from the schedule on the half-days of worker examinations considered (3).

Workers came from different types of companies: 80.4% (n=2979) were working in the private sector (including workers in the agricultural sector) and 19.6% in the public sector (n=725). In this first study, the workers filled out a questionnaire while awaiting routine examination. Self-reported symptoms were evaluated through a modified version of the standardised Nordic questionnaire (4). They were also asked about certain co-morbidities: 3.7% had a thyroid problem (n=135); 1.7% had diabetes (n=61); 8.2% were obese (n=300). Physical examinations were conducted following the recommendations of the European consensus published in 2001 in a criteria document for evaluating the work-relatedness of UL-MSDs (5). The whole protocol has already been described in detail (6). In this sample, 12.7% of the workers had at least one of the six most common UL-MSDs (rotator cuff syndrome, lateral epicondylitis, ulnar tunnel syndrome, carpal tunnel syndrome, flexor-extensor peritendinitis or tenosynovitis of the forearm-wrist region, or de Quervain's disease). Study of the representativeness of the initial sample (7) showed no major selection bias. There was only slight underrepresentation of women and employees in public education (the latter not being monitored by occupational physicians in France).

In order to assess the impact of UL-MSDs on workers' occupational outcome, a prospective epidemiological study named "COSALI" was initiated (acronym for cohort of workers living in the Pays de la Loire region). All of the 3 710 workers included in the first survey received a follow-up questionnaire at their mailing address between 2007 and 2009. In this questionnaire, participants were asked in particular about their work status at the time of filling out the questionnaire.

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## **Outcome**

The employment outcome was studied first in order to identify the characteristics of the workers who were no longer working at the time of the second survey (in 2007-2009); then the occupational outcome of workers still employed was studied. These outcomes at the time of the second survey were analysed according to three groups defined by health status at baseline (61 subjects were excluded because of missing values on the health status at baseline):

- The “HEALTHY” group comprised the 2 519 subjects without UL-MSD or upper limb pain during the preceding 7 days at baseline (69% of the initial sample). Nevertheless, some of these workers might have a lower limb MSD, back pain, or some other health problem.
- The “PAIN” group comprised the 707 workers who had reported upper limb pain during the preceding 7 days (19%) at baseline, but who were not diagnosed as having UL-MSDs at the time of the physical examination.
- The “UL-MSD” group (12%) comprised the 423 workers who were diagnosed at baseline as having at least one of the six UL-MSDs under study.

## **Data analysis**

Comparison of percentages was assessed by Chi-square tests. Comparisons of mean age between groups were assessed by analysis of variance tests. In order to study the link between the health status groups at baseline and the employment outcome, a logistic regression model was performed for the outcome “no longer working” with the health status group as independent variable, adjusted for gender, age into 4 categories, occupational category, type of company and co-morbidities.

All analyses were performed with the SAS statistical software package (version 9.2: SAS Institute. Inc., Cary. NC. US). Each subject provided informed written consent to participation in the survey at baseline, and the study received approval from the French National Committee for Data Protection (Commission nationale de l’informatique et des libertés); first in 2001 and then in 2006.



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## **RESULTS**

### **Response rate**

The follow-up questionnaire was filled out by 2 332 subjects. The response rate represented 67.1% of the remaining initial 3 477 workers whose addresses were known by the investigators in 2007 (Figure 1). As the symptoms of 45 subjects were not described sufficiently precisely at baseline, they could not be divided into any health group. The final study population included 2 287 subjects.

Figure 1: Flowchart of study population for the follow-up questionnaire

### **Characteristics of the subjects**

The possible effect of selection was studied. Fewer men participated (59.4% responded, vs 64.8% of women,  $p=0.008$ ) and fewer aged <30 years (48.3% responded, vs 61.8%, 68.1% and 67.5% of workers initially aged 30 to 39 years, 40 to 49 years and over 50, respectively,  $p<0.0001$ ). Fewer unskilled blue collar workers responded (57.5%, vs 60.1% of skilled blue collar workers, 61.5% of white collar workers and 65.4% of managers, professionals and technicians,  $p=0.007$ ). Fewer subjects in the "HEALTHY" group responded (60.5%) than in the "PAIN" (66.1%) and the "UL-MSD" (69.7%) groups ( $p<0.001$ ).

### **Comparison of the three health status groups**

Age, gender, occupational category, type of company and obesity status differed statistically between the three groups (Table 1). The average age of the "UL-MSD" group was higher (49.3 years vs 44.7 in the "PAIN" Group and 42.8 in the "HEALTHY" Group) ( $p<0.0001$ ).

Table 1: Characteristics of subjects at the time of the second survey  
according to health status at baseline

	"HEALTHY" Group <sup>a</sup>		"PAIN" Group <sup>a</sup>		"UL-MSD" Group <sup>a</sup>		Chi-square Test
	n	%	n	%	n	%	
Gender							0.005
Male	892	69.5	240	18.	151	11.8	

					7				
					22.		14.		
Age	Female	633	63.0	227	6	144	3		<0.0001
	<30 years	317	78.3	75	5	13	3.2		
	30-39 years	485	72.4	126	8	59	8.8		
	40-49 years	465	62.3	163	8	118	8		
	≥50 years	258	55.4	103	1	105	5		
Occupational category	Managers	528	71.3	137	5	76	3		<0.0001
	White collar workers	423	69.8	107	7	76	5		
	Skilled blue collar workers	367	64.7	122	5	78	8		
	Unskilled blue collar workers	204	55.1	101	3	65	6		
Type of company	Public sector	1185	66.8	376	2	212	0		0.02
	Private sector (including Agriculture)	336	65.9	91	8	83	3		
Thyroid disorders	Yes	57	58.2	24	5	17	3		0.2
	No	1464	67.1	441	2	277	7		
Diabetes	Yes	20	55.6	7	4	9	0		0.09
	No	1500	66.9	458	4	285	7		
Obesity (BMI≥30)	Yes	115	61.8	36	4	35	8		0.03
	No	1394	67.4	424	5	251	1		

<sup>a</sup> "HEALTHY" Group: subjects working at baseline and without pain in upper limbs or clinically diagnosed UL-MSD

"PAIN" Group: subjects working at baseline with pain in an upper limb but without clinically diagnosed UL-MSD

"UL-MSD" Group: subjects working at baseline with a clinically diagnosed UL-MSD

## Employment outcome

At the time of the questionnaire, a total of 273 subjects had temporarily or definitively ceased working: subjects in the "UL-MSD" Group had more often ( $p<0.0001$ ) ceased working (20.7%,  $n=61$ ) than those in the "PAIN" group (14.1%,  $n=66$ ) and in the "HEALTHY" group (9.6%,  $n=146$ ). This association was found both in men (21.9% had ceased working in the "UL-MSD" Group, 11.7% in the "Pain" Group, and "8.1% in the "HEALTHY" Group) and in women (19.4%, 16.7% and 11.7% respectively). The subjects who had stopped working

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represented 19.3% (n=40) of the 207 subjects with rotator cuff syndrome at baseline and 27.0% (n=20) of the 74 with carpal tunnel syndrome at baseline. The percentage of workers who had stopped working was not significantly different between subjects with lateral epicondylitis (n=9 who had stopped working) and those without. The same non-significant result was found in workers with ulnar tunnel syndrome (n=5), with flexor-extensor peritendinitis (n=4), or with de Quervain's disease (n=7).

The influences of age, gender, occupational category, type of company and co-morbidities at baseline on the employment outcome were studied. Age was a major factor causing cessation of work in each group ( $p < 0.0001$ ). Of the 466 subjects aged over 50 years at baseline, 31.8% (n=82), 39.8% (n=41) and 43.8% (n=46) had ceased working in the "HEALTHY", "PAIN" and "UL-MSD" groups, respectively. The differences between the three groups were of borderline significance ( $p = 0.07$ ). The number of retired subjects was different between the groups, with 4.9% (n=74) in the "HEALTHY" group, 6.9% (n=32) in the "PAIN" group and 11.2% (n=33) in the "UL-MSD" group ( $p = 0.0001$ ). The mean age of retired subjects did not differ between the groups (59.3 years). After excluding retired subjects, subjects over 50 years at baseline were studied: 5.9% (n=11) had ceased working in the "HEALTHY" group, 14.1% (n=10) in the "PAIN" group and 20.3% (n=15) in the "UL-MSD" group ( $p = 0.002$ ), compared to 4.9% (n=61) of the subjects under 50 years at baseline in the "HEALTHY" group, 6.7% (n=24) in the "PAIN" group and 6.9% (n=13) in the "UL-MSD" group ( $p > 0.05$ ).

The employment outcome also varied with gender. In the "HEALTHY" group, 11.7% (n=74) of women had ceased working compared to 8.1% (n=72) of men ( $p = 0.02$ ). However, gender was not a statistically significant factor related to ceasing working in the "PAIN" and "UL-MSD" groups. The occupational category at baseline ( $p = 0.10$ ) and the type of company ( $p = 0.20$ ) were not significantly associated with the employment outcome. The factors having a thyroid problem or being obese at baseline were not significantly associated with a poor employment outcome. Workers with diabetes had more often ( $p = 0.007$ ) ceased work (26.3%, n=10) than those without diabetes (11.9%, n =272).

Gender, age and diabetes were thus associated with “no longer working” status in bivariate analyses. After adjusting for these three characteristics and on occupational category, type of company and other co-morbidities in logistic regression, the health status at baseline was still found to be a statistically significant variable associated with the employment outcome (Table 2). The same result was found when studying only non-retired subjects (Table 2).

Table 2: Results of the two logistic regressions conducted for the “no longer working” and “no longer working in non-retired subjects” outcomes

Risk factors at baseline	Logistic regression <sup>b</sup> (all workers)				Logistic regression <sup>b</sup> (after exclusion of the non-retired)				
	Still working	Ceased working (for any reason)	OR (95% CI)	p	Still working	Ceased working and non-retired	OR (95% CI)	p	
	n	n			n	n			
Health Group	“HEALTHY” Group <sup>a</sup>	1 356	146	1	0.03	1 356	72	1	0.006
	“PAIN” Group <sup>a</sup>	393	65	1.3 (0.9 to 1.9)		393	34	1.5 (1.0 to 2.4)	
	“UL-MSD” Group <sup>a</sup>	225	61	1.6 (1.1 to 2.4)		225	28	2.2 (1.3 to 3.7)	
Gender	Male	1 127	132	1	0.01	1 127	42	1	<0.0001
	Female	844	140	1.5 (1.1 to 2.2)		844	92	2.7 (1.7 to 4.2)	
Age	<30 years	360	38	1	<0.0001	360	38	1	<0.0001
	30-39 years	624	32	0.5 (0.3 to 0.8)		624	32	0.5 (0.3 to 0.8)	
	40-49 years	697	34	0.5 (0.3 to 0.8)		697	28	0.4 (0.2 to 0.6)	
	≥50 years	290	168	5.7 (3.8 to 8.5)		290	36	1.1 (0.6 to 1.8)	
Occupational category	Managers, professionals, technicians	657	71	1	>0.10	657	28	1	>0.10
	White collar workers	513	81	1.3 (0.9 to 1.9)		513	50	1.4 (0.8 to 2.3)	
	Skilled blue collar workers	481	76	1.7 (1.1 to 2.4)		481	26	1.5 (0.8 to 2.6)	
	Unskilled blue collar workers	320	45	1.4 (0.9 to 2.2)		320	30	1.6 (0.9 to 2.9)	
Type of company	Public sector	448	51	1	0.01	448	15	1	0.002
	Private sector (including Agriculture)	1523	221	1.6 (1.1 to 2.3)		1523	119	2.5 (1.4 to 4.4)	
Thyroid disorders	No	1889	257	1		1889	124	1	
	Yes	82	15	0.9 (0.5 to 4.6)	>0.10	82	10	1.4 (0.7 to 2.9)	>0.10
Diabetes	No	1946	263	1		1946	131	1	
	Yes	25	9	2.0 (0.8 to 4.9)	>0.10	25	3	1.1 (0.3 to 4.1)	>0.10
Obesity	No	1815	243	1		1815	119	1	
	Yes	156	29	1.1 (0.7 to 1.7)	>0.20	156	15	1.3 (0.7 to 2.3)	>0.20

<sup>a</sup> “HEALTHY” Group: subjects working at baseline and without pain in upper limbs or clinically diagnosed UL-MSD

“PAIN” Group: subjects working at baseline with pain in an upper limb but without clinically diagnosed UL-MSD

“UL-MSD” Group: subjects working at baseline with a clinically diagnosed UL-MSD

<sup>b</sup> The ORs presented are mutually adjusted for all the risk factors included in the logistic regression models.

## Reasons for ceasing work

The reasons for ceasing work varied between the 273 workers who left work. Retirement was the main reason for the workers who no longer worked (Table 3). The rates of retired and non-retired subjects did not differ between the three groups. However, of the subjects aged over 50 years at baseline and who no longer worked, 86.6% (n=71) in the “HEALTHY” group were retired, whereas the figure was 75.6% (n=31) in the “PAIN” group and 67.4% (n=31) in the “UL-MSD” group (p=0.03).

More people ceased work voluntarily (for child rearing or sabbatical year) in the “HEALTHY” group (8.2%) than in the “PAIN” (1.5%) or “UL-MSD” (3.3%) groups (Table 3). Sick leave was more often the reason in the “PAIN” group (21.2%) than in the “HEALTHY” (10.3%) or “UL-MSD” (9.8%) groups. More also ceased work for “invalidity” reasons in the “UL-MSD” group (9.8%) than in the “HEALTHY” (2.7%) or PAIN (3.0%) groups, “invalidity” being a French administrative status for workers in a general health condition that is too poor to allow them to work any longer. This kind of situation is irrespective of the type of medical problem, and most of these subjects will never be able to work again.

Table 3: Reasons for not working for subjects no longer in employment in relation to health status at baseline

Reasons for not working	"HEALTHY" Group <sup>a</sup>		"PAIN" Group <sup>a</sup>		"UL-MSD" Group <sup>a</sup>	
	n	%	n	%	n	%
Retirement	74	50.7	32	48.5	33	54.1
Unemployed	24	16.4	13	19.7	11	18.0
Sick leave	15	10.3	14	21.2	6	9.8
Voluntary cessation of work (child rearing; sabbatical year)	12	8.2	1	1.5	2	3.3
Invalidity	4	2.7	2	3.0	6	9.8
Other reason	17	11.6	4	6.1	3	4.9

<sup>a</sup> "HEALTHY" Group: subjects working at baseline and without pain in upper limbs or clinically diagnosed UL-MSD

"PAIN" Group: subjects working at baseline with pain in an upper limb but without clinically diagnosed UL-MSD

"UL-MSD" Group: subjects working at baseline with a clinically diagnosed UL-MSD

## Occupational outcome

The occupational outcome of subjects still working at the time of the second survey was also studied. More subjects in the “PAIN” group reported they had changed their workstation in the same company, and the proportion of subjects having changed company was also higher in this group (Table 4) than in the two other groups. An overall statistically significant difference was found in the evolution of their workstation (p=0.04).

Table 4: Work evolution in relation to health status at baseline, for subjects still working

	No change		New workstation In the same company		New company	
	n	(%)	n	(%)	n	(%)
“HEALTHY” Group <sup>a</sup>	921	67.2	261	19.1	188	13.7
“PAIN” Group <sup>a</sup>	238	60.0	95	23.9	64	16.1
“UL-MSD” Group <sup>a</sup>	161	68.8	49	20.9	24	10.3
All groups	1 320	66.0	405	20.2	276	13.8

<sup>a</sup> “HEALTHY” Group: subjects working at baseline and without pain in upper limbs or clinically diagnosed UL-MSD

“PAIN” Group: subjects working at baseline with pain in an upper limb but without clinically diagnosed UL-MSD

“UL-MSD” Group: subjects working at baseline with a clinically diagnosed UL-MSD

## **DISCUSSION**

One original feature of our study was that the cohort comprised a wide range of workers, not only workers at high risk of UL-MSDs. Using data from a surveillance system provides an internal reference group, whereas this is not possible with data from compensation claims or hospital referral.

The response rate at the time of the second survey was lower in the “HEALTHY” Group and higher in the “UL-MSD” Group. Being a woman, being older than 50 years or working as a blue collar worker are all known risk factors for UL-MSDs (7). We therefore expected to find these characteristics more often in the “UL-MSD” Group. While age or having the symptoms under study does not always influence participation in similar ways in health surveys, women more often respond than men, but blue collar workers usually participate less (8). The higher response rate in the “UL-MSD” group that we observed could thus be explained by the fact that subjects with UL-MSDs at baseline might have felt more involved in this study.

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In bivariate analyses, the type of company was not significantly associated with the employment outcome, though we could have expected that subjects in private companies would more often have ceased working (9) (10) (11). [Analyses indicated \(not shown\) that age and social category were confounding factors in the relation between the type of company and the employment outcome.](#) After taking into account age and social category in the regression model, working in the private sector was significantly associated with ceasing working, as we expected.

The study is based on the comparison of three health groups. Our research hypothesis was that workers with upper-limb pain (but without clinically diagnosed UL-MSD) were more likely to have problems meeting demands at work than workers without pain, but to a lesser extent than workers with a diagnosed UL-MSD. This hypothesis was confirmed. One significant result was that more subjects with upper limb pain at baseline had ceased working at the second point, (1.5 times more often than subjects without upper limb pain at baseline). The second significant result was that twice as many workers with a previously diagnosed UL-MSD declared they had ceased work at the second point, than the subjects without upper limb pain at baseline. The difference was clear for all UL-MSDs together, particularly for rotator cuff syndrome and carpal tunnel syndrome (the smaller number of subjects with any one of the other four UL-MSDs considered here at baseline did not allow us to reach a conclusion regarding higher rates of ceasing work). These results were found for both women (1.4 times more women with pain in the upper limb (16.7%) at baseline had ceased working compared to women in the “HEALTHY” group (11.7%)) and men (2.7 times more men with an UL-MSD at baseline (21.9%) had ceased working compared to men in the “HEALTHY” group (8.1%)). The finding that 20.7% of subjects in the “UL-MSD” group had ceased working is consistent with the results of a recent study on the employment outcome of subjects working just before surgical release of the median nerve due to carpal tunnel syndrome in which one in ten had not returned to work 12 to 24 months later (12). Our first

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survey showed that 12.7% of workers suffered from an UL-MSD at baseline (7). A very large number of workers might therefore cease working in the years to come because of UL-MSDs.

Several studies have focused on the association between health and ceasing work (for any reason), but they have mainly dealt with general health and not particularly with UL-MSDs (13)(14). One study involving workers in the private sector initially aged between 30 and 54 years showed a clear positive impact of poor health on definitive cessation of work: the risk after four years was more than 1.5 times higher for those with self-reported poor health (14). Another recent study reported more unemployment among men aged between 18 and 50 years after a medical consultation related to musculoskeletal symptoms while they were performing military service (15). Having a diagnosed MSD also increased the probability of leaving a job as a construction roofer (16). The latter study was based on declared health status. One benefit of our study was that it involved a standardised medical examination following European recommendations (5).

The types of association between work and UL-MSDs reported in the literature are diverse. As we undertook a prospective study, the interval between the two surveys in our study allowed us to draw at least partial causal conclusions regarding the effects of health status on the employment outcome, though we did not request more precise information about the reasons for ceasing work. For example, we did not ask whether the musculoskeletal pain was the reason for ceasing work. For workers with diagnosed UL-MSDs who were unfit for work at the time of the study or on long term sick leave, it was assumed that “no longer working” was at least partly due to the previously diagnosed UL-MSD. It is possible that other factors, such as for example co-morbidities, may have influenced the employment outcome. Though we did not find any statistical link between employment outcome and obesity or thyroid problems, more workers with diabetes had ceased work in our study. However, in the adjusted logistic regression, the significance of the



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link between employment outcome and UL-MSD status persisted. The persistence and the prior existence of upper limb pain suggested an at least partial causal relationship between UL-MSD status and the employment outcome, whatever the co-morbidities.

One study of workers' compensation claim data for more disabling UL-MSDs (2) reported higher rates than we did: a third of the workers had not returned to work in the same company two years after acceptance of their compensation claims for UL-MSDs, and 12% of these had retired or left work voluntarily and 18% had been dismissed.

There are several reasons for ceasing work (unemployment allowance, family reasons, temporary sick leave, etc). In our study, the reasons for ceasing work were not the same for workers with pain in an upper limb without a clinically diagnosed UL-MSD as for workers with a diagnosed UL-MSD. The former more often had had occasional sick leave. The latter (who were older on average) were more likely to be on longer sick leave ("invalidity status"). Moreover, the declared work status can sometimes differ from the administrative status: unemployed women may have stated they were at home raising children; and older subjects with an unemployment pension may have said they were retired. Among the individuals who had ceased working for retirement, some (the youngest) may have chosen so-called "early" retirement. Indeed, in France some workers can make an agreement with their company no longer to work in the two to three years before they can legally retire; then they receive a special unemployed allowance until they retire. As they do not have to look for a new job, such individuals usually consider themselves as retired. As we believe that health status may have influenced such decisions, we chose to keep this kind of worker in the first analyses. Nevertheless, the second analysis excluded them: the results did not change.

A review of the literature showed both effects of direct selection due to health on unemployment and effects of unemployment on health (13). One of our concerns was to establish whether workers with an UL-MSD were more often unemployed than healthy workers. However, we did not find more subjects receiving unemployment allowance among

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the non-working subjects in the “PAIN” and “UL-MSD” groups than in the “HEALTHY” group, possibly because the number of subjects in this category was too small in the survey.

We found that the employment outcome due to UL-MSDs was particularly poor for workers aged over 50 years. When they were not retired, those with previous pain in an upper limb were twice as likely to have ceased work as those without previous pain. Moreover, subjects diagnosed with an UL-MSD at baseline were three times more likely to have ceased work at the time of the second survey.

Though France has one of the longest life expectancies in the world, the employment rate for people aged 55 to 64 years is one of the lowest in the European Union: it was 38.9% in 2009 in France according to the French Economic Institute (Insee) (17). The average age of retired subjects in our study did not differ between the three groups (59.3 years). It was close to the average age for retirement in France (59.3 years in 2008 and 60.0 in 2009 (18) according to Eurostat). Health can influence the capacity to work while ageing (19). We would have expected the retired subjects with a previously diagnosed UL-MSD to be younger because they would more often have taken early retirement. One limitation of our study was that the follow-up questionnaire did not allow us to establish whether the subjects decided themselves to retire or whether they *had* to retire before the legal age. Although we did not find any differences in retirement due to UL-MSDs, our results suggest that upper limb musculoskeletal pain (whether clinically diagnosed or not) more often led to ceasing work a few years later. This was especially true for older workers.

Health can influence the assignment to a work station. This study emphasizes a final finding of importance for the prevention of UL-MSDs: among workers still at work, those who gained most benefit from a change in their workstation or company were those feeling pain in the upper limb but without any clinically diagnosed UL-MSD. This suggests that companies more often proposed a change in work station to workers experiencing pain but who were not yet disabled, as also found by Defresne *et al* (20). This may be related to the fact that more

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subjects in the “UL-MSD” Group had stopped working than in the “Pain” Group, for reasons linked to neither the family nor retirement. If we consider that this “Pain” Group represents subjects with a lower level of disease than those in the “UL-MSD” Group, this suggests that, ceasing work is a more common consequence for more disabled workers, while a change in the work station is still possible for workers with lower levels of disease.

In conclusion, this study emphasizes both the need to consider UL-MSD status in work policies for all workers, particularly for older workers, and the need for remaining in or returning to work programmes for patients with an UL-MSD.

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