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Alexis Descatha, Ellen Imbernon

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# Working in temporary employment and exposure to musculoskeletal constraints

Y. Roquelaure<sup>1</sup>, A. Petit LeManach<sup>1</sup>, C. Ha<sup>2</sup>, C. Poisnel<sup>1</sup>, J. Bodin<sup>1</sup>, A. Descatha<sup>3</sup> and E. Imbernon<sup>2</sup>

<sup>1</sup>University of Nantes-Angers-Le Mans, Université CHU Angers, Laboratory of Ergonomics and Epidemiology in Occupational Health, 49933 Angers, France, <sup>2</sup>Department of Occupational Health, French Institute for Public Health Surveillance, 94415 Saint-Maurice Cedex, France, <sup>3</sup>INSERM U1018, Université de Versailles St-Quentin, Centre for Research in Epidemiology and Population Health, Epidemiology of Occupational and Social Determinants of Health, F-94807 Villejuif, France.

Correspondence to: Y. Roquelaure, Laboratory of Ergonomics and Epidemiology in Occupational Health, Faculty of Medicine, rue Haute de Reculée, 49045 Angers Cedex 01, France. Tel: +33 2 41 73 59 12; fax: +33 2 41 73 59 09; e-mail: yvroquelaure@chu-angers.fr

<b>Background</b>	In recent years, temporary work (TW) has increased in European countries due to the greater uncertainty in the economy.
<b>Aims</b>	To compare the prevalence of non-specific musculoskeletal symptoms of the upper extremities (UEMSDs) and their main risk factors in blue-collar workers employed through temporary agencies (TW) and in those in permanent employment (PE).
<b>Methods</b>	UEMSDs occurring during the preceding 7 days were assessed using a Nordic questionnaire completed by 1493 blue-collar workers randomly included in a surveillance programme for UEMSDs (171 in TW and 1322 in PE) in a large French region. Personal factors and work-related risk factors for UEMSDs were assessed by self-administered questionnaires.
<b>Results</b>	The prevalence of UEMSDs during the preceding 7 days did not significantly differ between workers in TW or PE, except for symptoms of the wrist/hand region [prevalence 20%, 95% confidence interval (CI) 14–26 versus 15%, 95% CI 13–17, $P < 0.05$ ]. TW was characterized by higher exposure to paced work (OR = 2.0, 95% CI 1.4–3.0), repetitive work (OR = 1.7, 95% CI 1.6–3.4), awkward postures of the wrist (OR = 1.7, 95% CI 1.2–2.4) and intensive use of vibrating hand tools (OR = 1.7, 95% CI 1.1–2.3). Workers in TW suffered from a lack of autonomy (OR = 2.5, 95% CI 1.7–3.6) and skill discretion at work (OR = 2.0, 95% CI 1.3–3.1) more frequently, but there was no difference in relation to psychological demands of the task or social support.
<b>Conclusions</b>	Temporary workers were more frequently exposed to working time constraints, repetitive work and biomechanical constraints of the wrist/hand region when compared to permanent workers and may represent a subpopulation at particularly high risk of UEMSDs.
<b>Key words</b>	Epidemiology; musculoskeletal disorders; temporary work; working constraints.

## Introduction

As in many European countries, the uncertainty in the economy has resulted in the increased use of non-permanent contracts in France in recent years [1]. This form of employment mainly involves people working on fixed-term contracts or through temporary employment agencies or on-call services [1]. Such insecure employment conditions are characterized by reduced job security, short periods of on-the-job training, lower levels of experience of the tasks and knowledge of workplace hazards and high risk of occupational injuries and psychological distress [1–4]. The temporary service industry has been associated with a high incidence of workers' compensation

claims for upper extremity musculoskeletal disorders (UEMSDs) [4,5] and higher prevalence rates for muscular pain in temporary workers compared with permanent workers [6]. However, contradictory results have been reported and no firm conclusion can be drawn on the impact of temporary work (TW) on musculoskeletal health [1,4].

Since the definition of employment uncertainty varies according to national legislation, for the purposes of this study, TW from hereon refers to temporary agency workers, accounting for a ~3% of the French workforce (in 2004).

The aim of this study was to assess the prevalence of non-specific UEMSDs in workers in TW and their exposure to work-related risk factors in comparison to workers in permanent employment (PE).

## Methods

For this cross-sectional study, data from the surveillance system for musculoskeletal disorders (MSDs) collected by a regional network of 83 occupational physicians (OPs) among workers of the French Pays de la Loire region was used. This surveillance system was designed to assess prevalence rates of MSDs and their risk factors in the working population and uses the recommendations of the 'Criteria document for evaluating the work-relatedness of upper-extremity musculoskeletal disorders' to offer data comparable with other European countries [7,8]. The economic structure of the region, which represents 5% of the French working population, is similar to that of most French regions. Participants were randomly selected from workers undergoing a regularly scheduled health examination between April 2002 and April 2005. The Pays de la Loire study received the approval of the French National Committee for Data Protection (CNIL: Commission Nationale Informatique et Liberté).

Non-specific musculoskeletal symptoms (pain, discomfort, tenderness and numbness) of the upper extremities (UEMSDs) occurring during the preceding 7 days were assessed using a Nordic questionnaire, including a mannequin to denote the hand-wrist, elbow, shoulder, neck and low back regions, and a visual analog scale ranging from 0 to 10 was used to assess the intensity of symptoms [9,10].

Personal factors, medical history and perceived exposure to the main work-related physical (e.g. force, repetitiveness of the task, awkward postures), psychosocial and organizational factors (e.g. time constraints, job rotation) were collected with a self-administered questionnaire [11]. The assessment referred explicitly to a typical working day during the previous 12 months. Perceived biomechanical exposure was quantified according to European consensus [8], except for the perceived physical workload, which was assessed by a psychophysical rating scale of perceived exertion (20-RPE Borg scale) [10,12]. Psychosocial factors were appraised according to the 'demand—autonomy' model of stress at work and using the validated French version of Karasek's 'Job Content Questionnaire' [12].

The prevalence of UEMSUs was computed by dividing the number of subjects suffering from unilateral or bilateral symptoms by the total number of workers included. Exposure of blue-collar workers to work constraints in TW and in PE was compared using logistic regression models unadjusted and adjusted for age and gender.

## Results

The study population comprised 3710 workers (58% men and 42% women) with a mean age of 38.7 years [standard deviation (SD) 10.3 years]. Comparison of their socio-economic status and activity sectors with the last available French census (1999) (<http://www.insee.fr>) showed no major differences for either gender. The distribution of

occupational categories was close to that of the regional workforce, except for occupations not surveyed by OPs (e.g. shopkeepers and independent workers) and consisted of blue-collar workers (43%), low-grade white-collar workers (27%) and high-grade white-collar workers (30%) [12]. Workers were principally in PE in private (75%) or public companies (14%), 194 worked through temporary agencies (5%) and 163 (4%) in fixed-term and seasonal work. Those in TW were mainly (88%) low-grade blue-collar workers (e.g. plant and machine operators, assemblers, material handlers, packers, labourers in construction and agriculture or horticulture) corresponding to the first and second skill levels of the International Standard Classification of Occupations (ISCO-08) of the International Labour Organization [13]. Analyses were therefore only performed for 171 blue-collar workers in TW and 1322 in PE because of their overrepresentation in TW [4]. The percentages of men in TW and in PE were similar (74 versus 77%), but temporary workers were younger [mean age 29.4 years (SD 9.3) years versus 39.7 (SD 10.0) years,  $P < 0.001$ ]. The prevalence rates of pain and musculoskeletal symptoms occurring during the preceding 7 days in the upper extremity [35%, 95% confidence interval (CI) 28–42], shoulder/arm (16%, 95% CI 11–22), elbow/forearm (10%, 95% CI 5–14) and wrist/hand (20%, 95% CI 14–26) regions were high in temporary workers (Table 1). However, the prevalence rates did not differ significantly from those in permanent workers, except for the wrist/hand region, and this was observed for adjusted and unadjusted data for age and gender. The higher risk of symptoms in the wrist/hand region in temporary workers reached the level of statistical significance only after adjustment for age and gender (OR = 1.6, 95% CI 1.0–2.6;  $P < 0.05$ ). The intensity of musculoskeletal pain in the wrist/hand region did not differ between the two groups.

As shown in Table 1, temporary workers were exposed approximately twice as often to working time constraints when compared with permanent workers. These were mainly constraints typical of manufacturing work, such as paced work, and work pace dependent on an automatic rate, permanent control or colleagues' work. Temporary workers often worked under insecure employment conditions in contrast to permanent workers. In comparison with permanent workers, they were more often exposed to repetitive work and biomechanical constraints of the wrist/hand region, such as repetitive and sustained awkward postures of the wrist, and intensive use of vibrating hand tools. There was no difference from permanent workers in terms of shoulder biomechanical constraints (after adjustment for age and gender) and the physical demands of the job. Temporary workers more often suffered from lack of decision autonomy and skill discretion at work, but no difference was found regarding the psychological demands of the task or the social support from the hierarchy and colleagues.

**Table 1.** Prevalence of UEMSDs and exposure to risk factors for UEMSDs in blue-collar workers in temporary employment and blue-collar workers in PE

	TW, <i>n</i> = 171 <i>n</i> (%)	PE, <i>n</i> = 1322 <i>n</i> (%)	OR <sup>a</sup>	95% CI	<i>P</i>	OR <sup>a,b</sup>	95% CI	<i>P</i>
<b>Musculoskeletal symptoms during the preceding 7 days</b>								
Shoulder/arm	28 (16)	300 (23)	0.7	0.4–1.0	NS	0.8	0.5–1.3	NS
Elbow/forearm	17 (10)	135 (10)	1.0	0.6–1.7	NS	1.2	0.7–2.1	NS
Wrist/hand	34 (20)	197 (15)	1.4	0.9–2.1	NS	1.6	1.0–2.6	<0.05
Upper extremity	59 (35)	465 (35)	1.0	0.7–1.4	NS	1.2	0.8–1.8	NS
<b>Exposure to work-related risk factors</b>								
High repetitiveness of task ( $\geq 4$ h/day)	91 (53)	473 (36)	2.0	1.5–2.8	<0.001	2.3	1.6–3.4	<0.001
Paced work	53 (31)	229 (18)	2.1	1.5–3.0	<0.001	2.0	1.4–3.0	<0.001
Work pace dependent on automatic rate	63 (37)	264 (21)	2.3	1.6–3.2	<0.001	2.2	1.5–3.2	<0.001
Work pace dependent on colleagues' work	84 (50)	418 (33)	2.1	1.5–2.8	<0.001	2.1	1.5–3.0	<0.001
Work pace dependent on permanent controls	77 (46)	378 (30)	2.0	1.5–2.8	<0.001	1.9	1.3–2.8	<0.001
Work pace dependent on quantified targets	122 (73)	788 (61)	1.7	1.2–2.4	<0.01	1.3	0.9–1.9	NS
Work pace dependent on customers' demands	50 (30)	377 (29)	1.0	0.7–1.5	NS	0.8	0.5–1.2	NS
Working on different workstations ( $\geq 1$ day/week)	78 (48)	548 (43)	1.2	0.9–1.7	NS	1.2	0.8–1.7	NS
Work with colleagues in insecure employment	138 (81)	431 (33)	8.9	5.9–13.3	<0.001	8.5	5.5–13.1	<0.001
Working with the hand above shoulder level ( $\geq 2$ h/day)	45 (26)	256 (19)	1.5	1.0–2.1	<0.05	1.4	0.9–2.0	NS
Repetitive and sustained wrist torsion ( $\geq 2$ h/day)	109 (65)	645 (50)	1.9	1.3–2.6	<0.001	1.7	1.2–2.4	<0.01
High perceived workload (RPE Borg scale $\geq 15$ )	46 (27)	445 (34)	0.7	0.5–1.0	NS	0.8	0.6–1.2	NS
Use of vibrating hand tools ( $\geq 2$ h/day)	60 (35)	307 (23)	1.8	1.3–2.5	<0.01	1.6	1.1–2.3	<0.05
High psychological demand (score $\geq 22$ )	80 (47)	544 (42)	1.3	0.9–1.7	NS	1.3	0.9–1.8	NS
Low decision autonomy (score $\leq 32$ )	108 (64)	587 (45)	2.2	1.5–3.0	<0.001	2.5	1.7–3.6	<0.001
Low skill discretion (score $\leq 32$ )	136 (80)	902 (69)	1.8	1.2–2.7	<0.01	2.0	1.3–3.1	<0.01
Low social support from hierarchy (score $\leq 11$ )	71 (43)	564 (43)	1.0	0.7–1.4	NS	1.0	0.7–1.4	NS
Low social support from colleagues (score $\leq 11$ )	47 (28)	316 (24)	1.2	0.9–1.8	NS	1.2	0.8–1.8	NS

NS, non-significant.

<sup>a</sup>OR computed with workers in PE as reference.<sup>b</sup>OR adjusted for age and gender.

## Discussion

The study shows that temporary workers were more frequently exposed to time constraints, awkward postures of the wrist and vibration transmitted to the hand. They suffered from UEMSDs of the wrist/hand region more often than permanent workers but not in other anatomical regions of the upper limbs.

The strength of the study was the large sample of workers representative of the regional workforce according to activity sectors and occupational categories [7,12]. However, although insecure employment as a whole was correctly represented in our study, temporary workers were overrepresented, while workers with fixed-term employment were underrepresented. The characteristics of our sample of temporary workers, i.e. mainly male low-qualified blue-collar workers working in the manufacturing and construction sectors at high risk of MSDs, fit well with data from the French Ministry of Labour [14].

The main limitations of the study were however the self-assessment of musculoskeletal outcomes and work exposure and the cross-sectional design of the study.

Nonetheless, this study confirms the high prevalence of pain and musculoskeletal symptoms of the upper extremities in TW, despite the young age and low job tenure in the labour market of temporary workers. Contrary to our hypothesis and the results of previous studies reporting high rates of claims for MSDs in the temporary employment agency industry [4,5], temporary workers reported more musculoskeletal symptoms than permanent workers only in the wrist/hand region. The younger age of temporary workers could partly explain the small difference between the two groups since the adjusted ORs for age were higher than unadjusted ORs. Higher rates of UEMSDs of the wrist/hand region could be related to more strenuous working conditions in the manufacturing industry and construction sectors in the form of highly repetitive hand movements, greater inexperience and lower understanding of the task [3].

In accordance with knowledge on flexible work [1,2,5,6], temporary workers were highly exposed to time pressure and biomechanical constraints of the wrist/hand region, such as repetitive movements, awkward postures of the wrist and use of vibrating hand tools. These results cannot be explained by the sociodemographic differences



between workers in PE and TW since the ORs did not differ whether they were adjusted for gender and age or not. The time constraints for temporary workers were typically those generated by paced work on assembly lines [10], suggesting that temporary workers have a greater risk of UEMSDs of the wrist/hand region because they work at a more accelerated pace [3]. No difference was observed from permanent blue-collar workers in terms of the perceived physical demands of the job although they were more often involved in highly repetitive tasks in the manufacturing industry. Since these jobs are often highly physically demanding, we cannot exclude the possibility that temporary workers underestimated their physical workloads. As expected, temporary workers more often suffered from lack of autonomy and decision latitude to cope with the constraints of the work than permanent workers. Contrary to our hypothesis, they did not suffer more frequently from lack of social support from supervisors or colleagues when compared to permanent workers, whereas they often worked with colleagues in insecure employment and with short job tenure. This finding did not support the hypothesis that temporary workers might suffer from discrimination from both supervisors and permanent workers [3].

The very high level of exposure to repetitive work of temporary workers contrasts with the moderately high prevalence of UEMSDs (except for the wrist/hand region) in comparison with workers in PE. This could be explained by shorter employment periods than permanent workers, leading to lower duration of exposure to risk factors for MSDs that could have protected them from more severe soft tissue disorders.

In conclusion, temporary workers appeared to be more often exposed to time constraints, awkward postures of the wrists and vibrations transmitted to the hand–wrist region and may represent a subpopulation at particularly high risk of UEMSDs.

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## Conflicts of interest

None declared.

## References

1. Virtanen M, Kivimäki M, Joensuu M, Virtanen P, Elovainio M, Vahtera J. Temporary employment and health: a review. *Int J Epidemiol* 2005;**34**:610–622.
2. Benach J, Amable M, Muntaner C, Benavides FG. The consequences of flexible work for health: are we looking at the right place? *J Epidemiol Community Health* 2002;**56**:405–406.
3. Benavides FG, Benach J, Muntaner C, Delclos GL, Catot N, Amable M. Associations between temporary employment and occupational injury: what are the mechanisms? *Occup Environ Med* 2006;**63**:416–421.
4. Smith CK, Silverstein BA, Bonauto DK, Adams D, Fan ZJ. Temporary workers in Washington state. *Am J Ind Med* 2010;**53**:135–145.
5. Silverstein B, Viikari-Juntura E, Kalat J. Use of a prevention index to identify industries at high risk for work-related musculoskeletal disorders of the neck, back, and upper extremity in Washington state, 1990–1998. *Am J Ind Med* 2002;**41**:149–169.
6. Benavides FG, Benach J, Diez-Roux AV, Roman C. How do types of employment relate to health indicators? Findings from the Second European Survey on Working Conditions. *J Epidemiol Community Health* 2000;**54**:494–501.
7. Ha C, Roquelaure Y, Leclerc A, Touranchet A, Goldberg M, Imbernon E. The French Musculoskeletal Disorders Surveillance Program: Pays de la Loire Network. *Occup Environ Med* 2009;**66**:471–479.
8. Sluiter JK, Rest KM, Frings-Dresen MHW. Criteria document for evaluating the work-relatedness of upper extremity musculoskeletal disorders. *Scand J Work Environ Health* 2001;**27**(Suppl. 1):1–102.
9. Kuorinka I, Jonsson B, Kilbom A *et al.* Standardized Nordic questionnaires for the analysis of musculoskeletal symptoms. *Appl Ergon* 1987;**18**:233–237.
10. Hagberg M, Silverstein B, Wells R *et al.* *Work Related Musculoskeletal Disorders (WMSDs): A Reference Book for Prevention*. London: Taylor & Francis, 1995.
11. Descatha A, Roquelaure Y, Evanoff B *et al.* Selected questions on biomechanical exposures for surveillance of upper-limb work-related musculoskeletal disorders. *Int Arch Occup Environ Health* 2007;**81**:1–8.
12. Roquelaure Y, Ha C, Leclerc A *et al.* Epidemiologic surveillance of upper-extremity musculoskeletal disorders in the working population. *Arthritis Rheum* 2006;**55**:765–778.
13. International Labour Organization. *International Standard Classification of Occupations (ISCO-08)*, 2008. <http://www.ilo.org/public/english/bureau/stat/isco/> (28 January 2012, date last accessed).
14. Dares. *Premières synthèses. L'interim en 2008. Juin 2009, n° 27.4*. <http://www.travail-emploi-sante.gouv.fr/IMG/pdf/2009.06-27.4.pdf> (28 January 2012, date last accessed).

## Key points

- Temporary workers appear to be more frequently exposed to time constraints, awkward postures of the wrist and vibration transmitted to the hand–wrist region in a large sample of workers representative of a regional workforce.
- Temporary workers may represent a subpopulation at high risk of upper extremity musculoskeletal disorders of the wrist/hand region.