



IS JOB ROTATION A RISK FACTOR FOR CARPAL TUNNEL SYNDROME OR NOT ?

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Introduction: Carpal tunnel syndrome

- **Multifactorial risk model for CTS**

- **Personal risk factors**

- Often not modifiable: age, female gender,

- **Work-related risk factors:**

- Could be modified by preventive interventions

- **Biomechanical risk factors** (Palmer, 2007; VanRijn, 2009; Barcenilla, 2011)

- Repetitive wrist movements
- Forceful manual exertion
- Repeated bending / twisting of the wrist
- Sustained exposure to hand-arm vibration

Combination +++

- **Psychosocial factors at work:**

- Conflicting epidemiological data (VanRijn, 2009)

- **Factors related to the work organization**

- Few epidemiological data
- Structural organizational level aspects of the work process
- Indirect risk factor via the nature of the work activities, the duration of mechanical exposure, and psychosocial factors

Aim of the study

- To assess the personal, biomechanical, psychosocial and organizational risk factors for carpal tunnel syndrome (CTS)
- in workers exposed to various levels of work-related constraints,
- by using the data of the surveillance program for MSDs in the French Pays de la Loire region

Materials and Methods

- **Cross-sectional study :**
 - **3,710 workers** (2,161 men ; 1,549 women),
 - Randomly included by 83 occupational physicians in 2002-2005,
 - **Representative of the regional workforce** according to age, gender, activity sectors and occupational categories.
- **Symptomatic CTS** (Criteria for the evaluation of the work-relatedness of MSDs: Sluiter et al, 2001)
 - **intermittent paresthesias or pain in (at least) two of the first three digits;**
The symptoms may be present at night, as well)
 - **symptoms present during the medical examination** (or during at least 4 days the week preceding the medical examination)
- **Self administered questionnaire:**
 - **Medical history, personal factors and work-related risk factors**
- **Statistical analysis**
 - **Logistic regression** models for each gender.
 - Sensitivity analysis: only *clinically-diagnosed CTS* (symptomatic CTS WITH at least one positive physical examination sign)

Multivariate statistical model of CTS

- 156 cases of CTS diagnosed (89 women and 67 men)

	Men (n=59)			Women (n=82)		
	n/N	OR (95% CI)	P	n/N	OR (95% CI)	P
Age (1-year increment)		1.05 [1.02–1.08]	***		1.07 [1.04–1.10]	***
Body mass index (1 kg/m ² increment)		1.05 [1.02–1.17]	**		1.04 [0.99–1.09]	
Work pace / quantified target	41/1,054	1.9 [1.1-3.5]	*			
Job/task rotation (≥1 job rotation per week)	36/768	2.5 [1.5-4.2]	***			
Work with temporary workers				39/444	2.0 [1.2-3.3]	***
<10 min break possible / hour (in case of highly repetitive task)	6/87	2.0 [0.8-5.1]		14/106	1.7 [0.9-3.4]	
Wrist bending (≥2 h/day) and high physical demand (ref = 0)						
- 1 factor	24/626	1.6 [0.9-3.1]		33/442	1.6 [1.0-2.8]	
- 2 factors	15/260	2.2 [1.0-4.7]		17/174	1.6 [0.8-3.1]	
Vibrating hand tools (≥2 h/day)	17/364	1.5 [0.8-2.9]		10/61	2.4 [1.1-5.4]	*
Low skill discretion	38/972	1.8 [1.0-3.1]	*			
High psychological demand				54/728	1.9 [1.2–3.1]	**

In analyses only restricted to clinically-diagnosed CTS : job/task rotation : OR=2.9 [1.5–5.5]

Discussion

- This study showed that **several factors related to the work organization and psychosocial constraints were associated with CTS**, after adjustment for personal and biomechanical risk factors.
- **Three factors were related to the work organization:**
 - **High paced work dependent on strictly quantified targets:**
 - Major determinant of repetitive movements
 - **Work with temporary workers for women:**
 - Increased work load of experienced women because of the working time spent to train less qualified temporary colleagues
 - **Contrary to our expectations, job rotation between several workstations on various days of the week (≥ 1 /week) was highly associated with CTS among men.**

Discussion: job rotation as a preventive measure ?

- **Job rotation between several workstations often proposed to:**
 - decrease the mechanical load on the hand/wrist region by **varying the biomechanical stresses**,
 - **broadened the area of application** of the mechanical load
 - **increase the variability** of hand movements (only in case of job enlargement) (Hagberg *et al*,1995; Wells, 2010).
- **However, the epidemiological data supporting the preventive impact of job rotation on CTS are scarce and conflicting:**
 - Protective effects :
 - Roquelaure *et al* (1997): case control study of industrial workers,
 - Maghsoudipour *et al.* (2008): study in automotive workers (univariate analysis)
 - Wand *et al* (2007): neck and shoulder disorders in the garment industry
 - Negative effects:
 - Kuijer *et al* (2005): job-rotation may reduce the need for recovery and thus increase the risk of cumulative trauma of soft tissue in refuse collector workers.

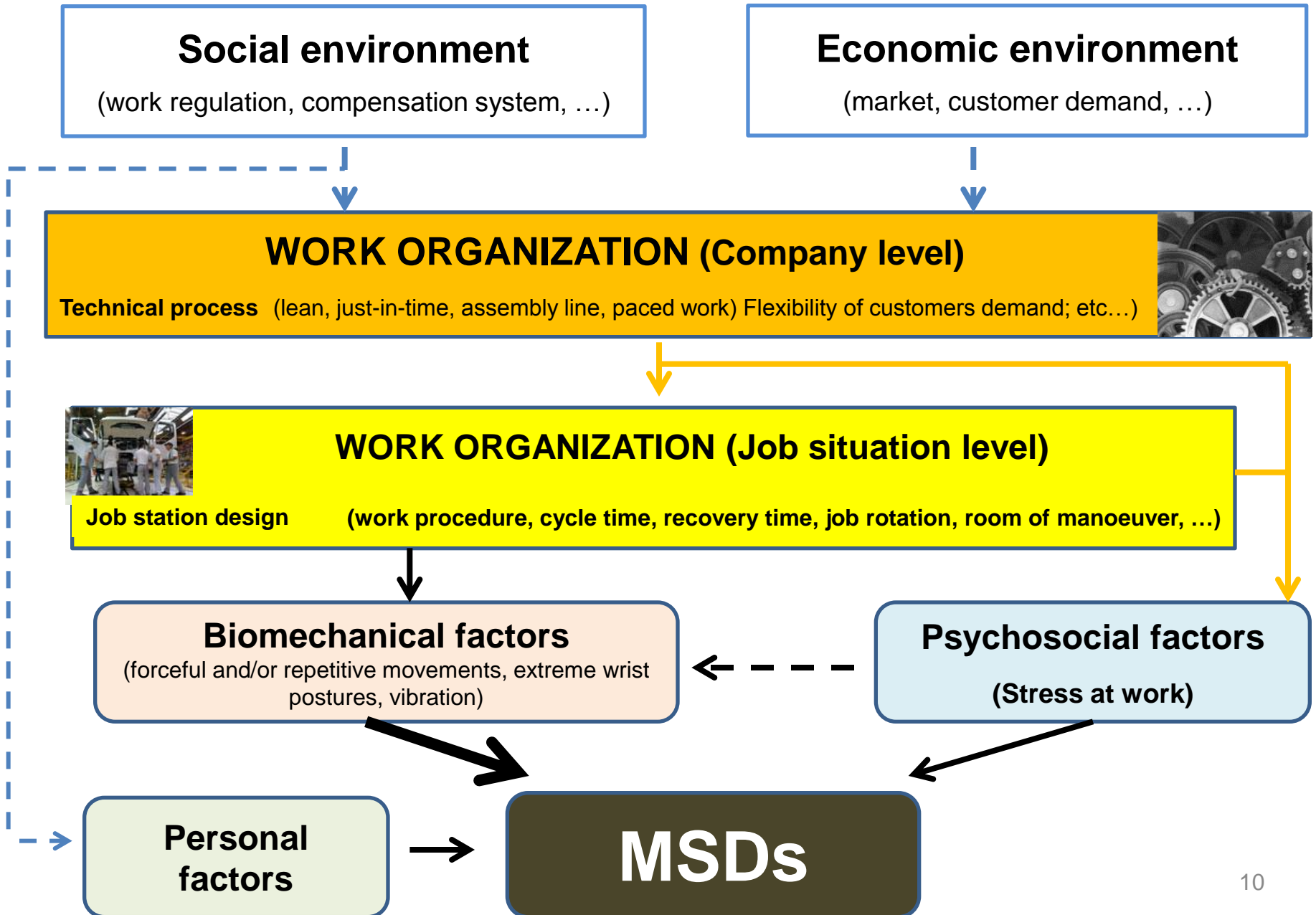
Discussion: job rotation as a risk factor for CTS ?

- **Job rotation can also have adverse effects:**
 - increases the task complexity and the number of actions to be learn,
 - requires longer training periods to develop efficient skills and gestures.
- **In lack of adequate planning and training periods:**
 - workers can be insufficiently skilled to cope with all dimensions of the tasks
 - leading them to adopt unsafe working techniques, that may increase the mechanical exposure.
 - **Job rotation without adequate training** may therefore be less effective than expected to reduce the risk of CTS;
- **Our results should be interpreted with caution :**
 - Cross sectional design of the study
 - No information on the existence of training periods before job rotation.
 - We cannot exclude that some workers suffering from CTS before the cross sectional study may have been allocated to enlarged jobs.

Conclusion

- **This study showed that several factors related to the work organization were associated with increased risk of CTS**
- **Job rotation may be less effective than expected to reduce the risk of CTS**
- **Increasing understanding of the impact of work organization on the risk of CTS is a major issue**
- **In the context of globalization of the economy, rationalization of production and flexibility of employment leading to “work intensification”.**

Work organization and CTS: conceptual ergonomic model



Thank you for your attention