

Social inequalities, musculoskeletal health and work: Does the perception of work-relatedness matter?

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Our research questions

- Are Quebec workers with lower socioeconomic status at greater risk of MSD?
- If yes, do working conditions explain these inequalities?
- Does the relationship between occupational class and MSD vary with respect to whether MSD are reported as work-related or not work-related?
 - Johannsson 1994, Mehlun et al 2009

1998 Quebec Health and Social Survey

- Population-based **survey of 15,330 private households** in Québec with an extensive occupational health section
- 2 questionnaires:
 - An **interviewer-administered questionnaire**: completed by a member of each household about all members of the household
 - weighted response rate 82.1%
 - 30,386 subjects
 - A **self-administered questionnaire**: completed by each member of the household aged 15 and over
 - weighted response rate 84% (69.0% overall response rate)
 - 20,773 subjects
 - 11,735 workers

Methods: Study Population

- Inclusion criteria:
 - Worked at least 6 months in main job
 - for at least 14 hours/week
 - Answered all 3 musculoskeletal symptom questions
- **7,265** respondents met above criteria
 - **4149 men**
 - **3116 women**

Methods : Case definition of MSD

- **Significant musculoskeletal pain of back, upper and/or lower extremities in the previous 12 months that interfered with activities and occurred often or all the time**
- Outcome variable with 5 categories:
 - **No pain (reference category)**
 - **Frequent work-related musculoskeletal pain (WMSD)**
 - **Frequent non work-related musculoskeletal pain (non-WMSD)**
 - Occasional WMSD
 - Occasional non-WMSD

Methods:

Independent variables

Socioeconomic indicator

Occupational class:

1. Senior managers, professionals
 2. Middle managers, semi-professionals and technicians
 3. Office, sales and service workers
 4. Skilled manual workers and supervisors
 5. Unskilled manual workers and labourers
- For women: categories 4 and 5 combined

Methods: Independent variables

Physical work demands

- **5-item scale** of physical work demands (score 0 to 15)
 - Manual handling of heavy loads
 - Repetitive work of hands or arms
 - Forceful exertion using tools or machines
 - Hand-arm vibration (use of vibrating hand tools)
 - Whole body vibration
- Each item rated on 4-point frequency response scale
- **4 categories: none (0); low (score 1-3); medium (4-6); high (7+)**
- Working posture (3 categories):
 - sitting
 - standing with freedom to sit at will
 - standing without freedom to sit at will

Methods: Independent variables

Psychosocial work demands

- Decision latitude (Karasek JCQ 9-items)
- psychological job demands (Karasek JCQ 9-items)
- Intimidation at work
- Difficult or tense situations with public

Personal factors

- Age
- Body mass index (BMI)
- Leisure time physical activity (exercise)
- Social support
- Smoking
- All analyses stratified by gender

Methods: statistical analyses

Multinomial logistic regression analyses stratified by gender

- Adjusted relative risk (**ARR**)
 - Adjusted for age, leisure-time physical activity, smoking, BMI, social support
- Comparison of 4 models of ARR of WMSD and non-WMSD:
 1. occupational class alone
 2. occupational class + physical work demands
 3. occupational class + psychosocial work demands
 4. occupational class + physical work demands + psychosocial work demands

- Measure % change in ARR (**% Δ ARR**) for each occupational class when work exposures taken into account
 - to measure contribution of work exposure to the disparities of MSD by occupational class



Results

Men:

Prevalence of MSD by occupational class

Occupational class	Work-related pain*	Non-work-related pain*
Senior managers, professionals	10.4	21.3
Intermediate managers, semi-prof., tech.	16.9	20.7
Office, sales, service workers	20.1	16.1
Skilled manual workers, supervisors	35.3	11.6
Unskilled manual workers, labourers	29.6	11.9

Women:

Prevalence of MSD by occupational class

Occupational class	Work-related MSD*	Non-work-related MSD
Senior managers, professionals	15.8	18.6
Intermediate managers, semi-prof., tech.	20.4	18.1
Office, sales, service workers	25.9	19.0
Skilled & unskilled manual workers, supervisors	32.2	12.7

* Cochran-Mantel-Haenszel test for trend with SUDAAN, $p < 0.001$

NB: No trend for Non-WMSD but manual workers have significantly less Non-WMSD than all the others

Prevalence of exposures to physical work demands by occupational class, in **men**

Occupational class	Physical work demands index			
	None	Low	Medium	High
Senior managers, professionals	79.5	15.8	3.3	1.5
Intermediate managers, semi-prof. & technicians	56.9	29.9	8.4	4.9
Office, sales, service workers	37.1	34.7	19.1	9.1
Skilled manual workers supervisors	12.5	22.5	28.8	36.4
Unskilled manual workers, labourers	14.9	26.9	29.5	28.7

* Cochran-Mantel-Haenszel test for trend with SUDAAN, $p < 0.001$

Prevalence of exposures to physical work demands by occupational class, in **women**

Occupational class	Physical work demands index*		
	None	Low	Medium or High
Senior managers, professionals	79.1	19.7	1.2
Intermediate managers, semi-prof. & technicians	57.3	34.5	8.1
Office, sales, service workers	57.2	30.3	12.5
4) Supervisors, skilled and unskilled manual workers	15.2	46.7	38.1

* Cochran-Mantel-Haenszel test for trend with SUDAAN, $p < 0.001$

Prevalence of exposures to psychosocial work demands by occupational class, in **men**

Psychosocial work demands

Occupational class	High psychological demands*	Low decision latitude*	Tense situations with public	Intimidation at work
-Senior managers, professionals	46.8	7.5	30.6	16.9
-Intermediate managers, semi-prof.	38.4	12.2	26.3	13.9
-Office, sales, service workers	34.2	35.9	33.9	16.6
-Skilled manual workers, supervisors	33.6	38.0	17.6	16.6
-Unskilled manual workers, labourers	24.6	65.0	22.4	19.3

* Cochran-Mantel-Haenszel test for trend with SUDAAN, $p < 0.001$

Men - Model 1: Relationships between MSD and occupational class

Model adjusted for age, BMI, exercise, smoking, soc. support	Non-WMSD		WMSD	
	ARR	95% CI	ARR	95% CI
Senior managers, professionals	1.0		1.0	
Intermediate managers, semi-prof., tech.	0.9	0.7-1.2	1.6	1.1-2.2
Office, sales, service workers	0.7	0.5-0.94	1.8	1.2-2.4
Skilled manual workers, supervisors	0.5	0.4-0.7	3.1	2.3-4.2
Unskilled manual workers, labourers	0.5	0.4-0.8	2.6	1.8-3.6

ARR = adjusted relative risk

MEN - Model 2: Relationships between MSD and occupational class taking into account physical work demands

Model adjusted for age, BMI, exercise, smoking, soc. support	Non-WMSD			WMSD		
	ARR	95% CI	% Δ ARR	ARR	95% CI	% Δ ARR
Senior managers, professionals	1.0			1.0		
Intermediate managers, semi-prof.	1.1	0.8-1.4		1.2	0.9-1.7	60
Office, sales, service workers	0.8	0.6-1.2	-46	1.1	0.8-1.5	90
Skilled manual workers, supervisors	0.8	0.6-1.1	-54	1.4	.99-1.9	83
Unskilled manual workers, labourers	0.7	0.5-1.01	-34	1.3	0.9-1.9	85
Physical work demands (ref: 0)	1.0			1.0		
-Low (1-3)	0.8	0.6-1.00		1.6	1.2-2.1	
-Medium (4-6)	0.8	0.6-1.02		2.3	1.7-3.0	
-High (7+)	0.5	0.4-0.8		2.9	2.2-3.8	
Working posture (ref: sitting)	1.0			1.0		
-standing with freedom to sit at will	0.7	0.4-0.97		0.98	0.7-1.3	
-standing without freedom to sit at will	0.9	0.7-1.1		1.3	1.04-1.6	

Men- Model 3: Relationships between MSD and occupational class taking into account psychosocial work demands

Model adjusted for age, BMI, exercise, smoking, soc. support	Non-work-related MSD			WMSD		
	ARR	95% CI	% Δ ARR	ARR	95% CI	% Δ ARR
Senior managers, professionals	1.0			1.0		
Intermediate managers, semi-prof.	0.94	0.7-1.2		1.7	1.2-2.4	-7
Office, sales, service workers	0.7	0.5-0.9	13	1.8	1.3-2.6	-8
Skilled manual workers, supervisors	0.5	0.4-0.7	0	3.2	2.4-4.4	-4
Unskilled manual workers, labourers	0.5	0.3-0.7	9	2.7	1.9-3.9	-3
Decision latitude (ref: high)	1.0			1.0		
-Medium	0.97	0.8-1.2		0.98	0.8-1.2	
-Low	1.1	0.9-1.4		1.2	.98-1.4	
Psychological job demands (ref: low)	1.0			1.0		
-Medium	0.9	0.7-1.1		1.4	1.2-1.7	
-High	0.9	0.7-1.2		1.8	1.5-2.1	
Intimidation at work (ref: never)	1.3	1.01-1.6		1.5	1.3-1.8	
-occasionally/fairly often/all the time						

Men-Model 4: Relationships between MSD and occupational class taking into account physical & psychosocial work demands

ARR = adjusted relative risk

Model adjusted for age, BMI, exercise, smoking, soc. support	Non-WMSD			WMSD		
	ARR	95% CI	% Δ ARR	ARR	95% CI	% Δ ARR
Senior managers, professionals	1.0			1.0		
Middle managers, semi-prof.	1.03	0.8-1.2		1.3	0.9-1.8	49
Office, sales, service workers	0.8	0.6-1.2	-43	1.2	0.8-1.6	79
Skilled manual workers, Supervisors	0.8	0.6-1.1	-58	1.5	1.1-2.1	75
Unskilled manual workers, labourers	0.7	0.5-1.03	-34	1.4	0.97-2.0	71
Physical work demands scale (ref:0)	1.0			1.0		
-Low	0.8	0.6-0.98		1.5	1.2-2.0	
-Medium	0.7	0.6-0.99		2.2	1.6-2.9	
-High	0.5	0.3-0.7		2.5	1.9-3.3	
Working posture (ref: sitting)	1.0			1.0		
-Standing with freedom to sit at will	0.7	.4-0.97		1.02	0.8-1.4	
- Standing w/o freedom to sit at will	0.8	0.7-1.1		1.3	1.05-1.6	
Psychological demands (ref: low)	1.0			1.0		
- medium	0.9	0.7-1.1		1.2	0.98-1.5	
- high	0.9	0.7-1.2		1.5	1.3-1.9	
Intimidation at work (ref: never)	1.0			1.0		
-occasionally/fairly often/all the time	1.3	1.01-1.6		1.5	1.3-1.8	

Discussion/Conclusions

- The relationship between MSD and occupational class is complex.
 - WMSD are associated with lower socioeconomic status (SES).
 - Non-work-related MSD are associated with higher SES.
- The associations between WMSD and lower occupational classes largely disappear when one adjusts for physical work demands.
- The relationship between WMSD and occupational class is largely explained by differences in the prevalence of physical work demands among occupational classes.

Discussion

- When non-WMSD and WMSD are combined – as is usually the case - some of the relationships between MSD and work exposures may be masked
 - this may depend on the proportion of the population studied that is of higher SES and has non-WMSD.

Study limits

- Cross-sectional survey, not prospective
- Missing data (non response) for the question on most important pain
- Lack of measurement of some relevant physical or psychosocial work exposures
 - e.g. postural demands, precarious work, social support at work
 - Implication for female workers
- Validity of physical work demand questionnaires (Stock et al 2005)
- Integration of all MSD in one outcome measure (e.g. back, upper extremity, lower extremity)



Thank you for your attention

Women - Model 1: Relationship between MSD and occupational class

<i>Model adjusted for age, exercise, smoking, BMI, social support</i>	Non-work-related MSD		WMSD	
	ARR	(95% CI)	ARR	(95% CI)
Occupational class				
1) Senior managers, professionals	1.0		1.0	
2) Intermediate managers, semi-professionals	1.0	0.7-1.4	1.3	0.9-1.8
3) Office, sales, service workers	0.99	0.8-1.3	1.5	1.2-2.1
4) Skilled and unskilled manual workers, labourers, supervisors	0.7	0.5-0.9	1.9	1.3-2.6

ARR = adjusted relative risk

Women -Model 2: Relationships between MSD and occupational class taking into account physical work demands

ARR = adjusted relative risk

<i>Model adjusted for age, exercise, smoking, BMI, social support</i>	Non-work-related MSD			WMSD		
	ARR	95% CI	% Δ ARR	ARR	95% CI	% Δ ARR
Senior managers, professionals	1.0			1.0		
Middle managers, semi-prof.	1.1	0.8-1.6		0.99	0.7-1.4	
Office, sales, service workers	1.1	0.8-1.4		1.2	0.9-1.5	70
Skilled and unskilled manual workers, labourers, supervisors	0.9	0.6-1.3	-63	0.98	0.7-1.4	102
Physical work demands (ref: 0)	1.0			1.0		
-Low	0.97	0.8-1.2		1.6	1.3-2.0	
-Medium or high	0.6	0.4-0.97		2.5	2.0-3.2	
Working posture (ref: sitting)	1.0			1.0		
-standing with freedom to sit at will	0.9	0.6-1.2		0.8	0.5-1.1	
-standing without freedom to sit at will	0.7	0.5-0.8		1.4	1.2-1.8	

Women - Model 3: Relationships between MSD and occupational class taking into account psychosocial work demands

<i>Model adjusted for age, exercise, smoking, BMI, social support</i>	Non-WMSD (non work-related)			WMSD		
	ARR	95% CI	% Δ ARR	ARR	95% CI	% Δ ARR
Senior managers, professionals	1.0			1.0		
Intermediate managers, semi-prof.	1.1	0.8-1.5		1.2	0.9-1.7	
Office, sales, service workers	1.1	0.8-1.5		1.6	1.2-2.2	-19
Supervisors, skilled trades/ Unskilled, labourers	0.8	0.5-1.1	-34	2.1	1.5-2.9	-22
Decision latitude (ref: high)	1.0			1.0		
-Medium	0.9	0.7-1.1		1.1	0.8-1.3	
-Low	0.8	0.6-1.0		1.2	0.9-1.5	
Psychological job demands (ref: low)	1.0			1.0		
-Medium	1.1	0.9-1.4		1.4	1.2-1.8	
-High	1.4	1.1-1.7		1.8	1.4-2.2	
Intimidation at work (ref: never)	1.0	0.8-1.3		1.4	1.1-1.6	
-occasionally/fairly often/all the time						
ARR = adjusted relative risk						

Women-full Model 4: Relationship between MSD and occupational class taking into account physical and psychosocial work demands

Model adjusted for age, exercise, smoking	Non-WMSD			WMSD		
	OR	95% CI	% Δ ARR	OR	95% CI	% Δ ARR
Senior managers, professionals	1.0			1.0		
Middle managers, semi-prof.	1.2	0.8-1.6		0.98	0.7-1.4	
Office, sales, service workers	1.2	0.9-1.6		1.2	0.95-1.6	56
Skilled and unskilled manual workers, labourers, supervisors	0.9	0.6-1.4	-77	1.2	0.8-1.7	79
Physical work demands scale (ref:0)	1.0			1.0		
-Low	0.9	0.8-1.2		1.5	1.2-1.9	
-Medium or high	0.6	0.4-0.9		2.3	1.8-3.0	
Working posture (ref: sitting)	1.0			1.0		
-Standing with freedom to sit at will	1.0	0.7-1.4		0.8	0.6-1.1	
- Standing w/o freedom to sit at will	0.7	0.6-0.9		1.4	1.1-1.7	
Psychological demands (ref: low)	1.0			1.0	1.2-1.9	
- high	1.3	1.04-1.7		1.5		
Intimidation at work (ref: never)	1.0	0.9-1.4		1.0	1.0-1.5	
-occasionally/fairly often/all the time	1.1			1.2		

MSD and Health Inequalities

- A strong relationship between health and socioeconomic status has been observed in numerous population studies in Canada and internationally
 - e.g. Cubbin 2000, Mackenbach 2003, Marmot 1991, 1997, 1998, 2004, 2007, Pekkanen 1995, Rose 1985, Whitehead 2006, Wilkinson 1996
- A number of studies have shown that health inequalities associated with occupational class diminish when one adjusts for physical and/or psychosocial work demands
 - e.g. Schrivens 1998, Marmot 1998, Borg 2000, Hemström 2005, Melchior 2005, 2006, Lundberg, Hemmingsson et Hogstedt (ed.) 2007
 - Until recently few studies have looked at MSD and social inequalities

Studies on social inequalities and MSD among workers

- A few very recent studies on occupational class or education and MSD have demonstrated the importance of physical or psychosocial work demands in accounting for musculoskeletal health disparities
 - Leclerc et al 2009 (France: education & low back pain)
 - Mehlun et al 2008 (Finland: occupational class and presence of neck & shoulder, low back pain)
 - Aittomäki 2007 (Finland: occupational class and multiple MSD)
 - Hagen et al 2006 (Education and disability pension for back pain - prospective)
 - Melchior 2006 (France: occupational class and 6 upper limb MSD)
 - Melchior 2005 (French GAZEL cohort: occupational sickness absence for MSD - prospective)

Discussion

- What proportion of health inequalities observed in relation to gender, age, immigrant status or ethnicity are attributable to differences in the prevalence of exposure to work demands?

Methods : Measure of MSD

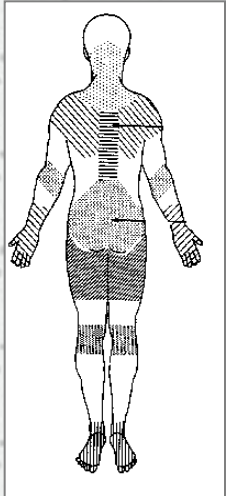
Question 1. Significant pain that interfered with activities in the previous 12 months

- **Adaptation of Nordic Questionnaire**
- Body diagram with 11 body regions identified
- 4-point frequency response scale
 - Never, occasionally, **fairly often, all the time**

Question 2. Most important site of pain that interfered with activities in previous 12 months

Question 3. Perception of relation to work

- WMSD: Pain entirely or partially related to work
- non-WMSD: Pain not related to work or “do not know”



Prevalence of exposures to psychosocial work demands by occupational class, in women

Psychosocial work demands

Occupational class	High psychological demands*	Low decision latitude*	Tense situations with public	Intimidation at work
- Senior managers, professionals	47.3	13.2	30.8	19.0
- Intermediate managers, semi-prof., technicians	42.0	20.0	31.1	21.3
- Office, sales, service workers	17.8	49.5	32.1	14.8
- Skilled and unskilled manual workers, labourers, supervisors	12.3	59.4	15.3	18.7