

Questionnaire: Work-related Physical Stress

1. Does your work require you to bend over or turn in a repetitive manner several times per hour?

Currently:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

Five years ago:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

2. Does your work involve performing repetitive hand- or finger-movements several times per minute? (for example, typing or sorting)

Currently:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

Five years ago:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

3. Do/did you lift or carry objects heavier than 10 kg?

Currently:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

Five years ago:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

4. Does your work require you to perform precision work for more than a total of two hours per day? (for example, fine mechanics, clock-making or dental work)

Currently:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

Five years ago:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

5. Does your work involve movements where your hands are placed below knee level for more than a total of 30 minutes per day? (for example, floor or ground work)

Currently:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

Five years ago:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

6. Do/did you perform work where your hands are/were placed above shoulder level for more than a total of 30 minutes per day?

Currently:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

Five years ago:

1. *never or rarely*
2. *1-3 days/month*
3. *1 day/week*
4. *2-4 days/week*
5. *every working day*
6. *not working*

7. What proportion of your working day do you work on a vibrating floor or seat? (for example, in a car, boat, aeroplane, tractor, or lorry)

Currently:

1. *not at all*
2. *1/4 time*
3. *1/2 time*
4. *3/4 time*
5. *full-time*
6. *not working*

Five years ago:

1. *not at all*
2. *1/4 time*
3. *1/2 time*
4. *3/4 time*
5. *full-time*
6. *not working*

8. What proportion of your working day do/did you work using vibrating hand-held machines? (for example, power drill, sander, nail gun, chainsaw, levers, steering wheels, etc.)

Currently:

1. *not at all*
2. *1/4 time*
3. *1/2 time*
4. *3/4 time*
5. *full-time*
6. *not working*

Five years ago:

1. *not at all*
2. *1/4 time*
3. *1/2 time*
4. *3/4 time*
5. *full-time*
6. *not working*

Supplementary Table S1: Occupation categories of those who were exposed to all 7 types of physical workload 5 years before baseline*

	Frequency	Percentage
metal machine work and building metal work	21	14.38
electrical and electronics work	19	13.01
other building and construction work	18	12.33
caretaking and cleaning work	9	6.16
lodging and catering service work	8	5.48

*Only the 5 most frequent occupations are shown.

Supplementary Table S2 : Adjusted odds ratios for the association of physical workload and development of RA

Physical Workloads		Cases/ Controls	5 Years Before Baseline							
			OR ¹ (95%CI)	OR ² (95%CI)	OR ³ (95%CI)	OR ⁴ (95%CI)	OR ⁵ (95%CI)	OR ⁶ (95%CI)	OR ⁷ (95%CI)	OR ⁸ (95%CI)
repetitive bending/turning	unexposed	963/2039	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)
	exposed	1925/2531	1.6(1.5-1.8)	1.6(1.5-1.8)	1.5(1.4-1.7)	1.5(1.3-1.7)	1.6(1.4-1.7)	1.5(1.4-1.7)	1.5(1.4-1.7)	1.6(1.5-1.8)
repetitive hand/ finger movements	unexposed	824/1546	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)
	exposed	2060/3020	1.3(1.2-1.4)	1.3(1.2-1.4)	1.2(1.1-1.4)	1.3(1.2-1.5)	1.3(1.2-1.4)	1.3(1.1-1.4)	1.3(1.2-1.5)	1.3(1.1-1.4)
lift or carry more than 10 kg	unexposed	1284/2496	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)
	exposed	1602/2077	1.5(1.4-1.7)	1.5(1.4-1.7)	1.5(1.3-1.6)	1.5(1.3-1.6)	1.5(1.4-1.7)	1.5(1.3-1.6)	1.5(1.4-1.7)	1.5(1.4-1.7)
precision work	unexposed	2536/4061	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)
	exposed	344/487	1.1(1.0-1.3)	1.1(1.0-1.3)	1.1(1.0-1.3)	1.1(0.9-1.3)	1.1(1.0-1.3)	1.1(1.0-1.3)	1.1(1.0-1.3)	1.2(1.0-1.3)
hands below knee level	unexposed	2215/3827	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)
	exposed	668/736	1.6(1.4-1.8)	1.6(1.4-1.8)	1.5(1.3-1.7)	1.5(1.3-1.7)	1.5(1.4-1.7)	1.5(1.3-1.7)	1.6(1.4-1.8)	1.6(1.3-1.8)
hands above shoulder level	unexposed	2028/3675	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)
	exposed	857/893	1.8(1.6-2.0)	1.8(1.6-2.0)	1.7(1.5-1.9)	1.7(1.5-1.9)	1.7(1.5-1.9)	1.7(1.5-1.9)	1.7(1.5-1.9)	1.7(1.6-1.9)
vibration	unexposed	2353/3927	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)	1.0(ref.)
	exposed	535/634	1.5(1.3-1.8)	1.5(1.3-1.8)	1.4(1.2-1.6)	1.5(1.3-1.7)	1.5(1.3-1.7)	1.4(1.3-1.7)	1.5(1.3-1.8)	1.5(1.3-1.7)

1 OR adjusted for age (10 strata), residential area and sex.

2 OR adjusted for age (10 strata), residential area, sex and BMI.

3 OR adjusted for age (10 strata), residential area, sex and university degree.

4 OR adjusted for age (10 strata), residential area, sex and alcohol (non-drinkers, low, moderate, high).

5 OR adjusted for age (10 strata), residential area, sex and smoke (ever/never)

6 OR adjusted for age (10 strata), residential area, sex and smoke (pack-years)

7 OR adjusted for age (10 strata), residential area, sex and time period.

8 OR adjusted for age (10 strata), residential area, sex and silica exposure.

Baseline is the year when the subjects were diagnosed with rheumatoid arthritis. RA=rheumatoid arthritis; OR=odd ratio;

95% CI= 95% confidence interval; ref. =reference

Supplementary Table S3 Association of different types of prolonged repetitive physical workload and risk of rheumatoid arthritis stratified by educational level

Type of Physical Workloads		Junior High School and Vocational School		Senior High School		University	
		cases/controls	OR(95%CI)	cases/controls	OR(95%CI)	cases/controls	OR(95%CI)
repetitive bending/turning	unexposed	251/395	1.0(ref)	276/619	1.0(ref)	396/977	1.0(ref)
	exposed	903/1007	1.4 (1.2-1.7)	581/821	1.6 (1.3-1.9)	357/604	1.4 (1.2-1.7)
repetitive hand/finger movements	unexposed	306/441	1.0(ref)	231/438	1.0(ref)	238/614	1.0(ref)
	exposed	847/958	1.3 (1.1-1.5)	622/1003	1.2 (1.0-1.4)	515/965	1.4 (1.1-1.7)
lift or carry more than 10 kg	unexposed	418/592	1.0(ref)	342/732	1.0(ref)	469/1105	1.0(ref)
	exposed	734/809	1.3 (1.1-1.5)	516/713	1.6 (1.3-1.9)	283/477	1.4 (1.2-1.7)
precision work	unexposed	1026/1232	1.0(ref)	743/1277	1.0(ref)	661/1438	1.0(ref)
	exposed	126/156	1.0 (0.7-1.2)	110/158	1.2 (0.9-1.6)	90/143	1.4 (1.1-1.9)
hands below knee level	unexposed	787/1029	1.0(ref)	668/1203	1.0(ref)	667/1480	1.0(ref)
	exposed	367/368	1.4 (1.1-1.6)	185/236	1.4 (1.1-1.8)	85/102	1.9 (1.4-2.5)
hands above shoulder level	unexposed	701/970	1.0(ref)	595/1150	1.0(ref)	642/1450	1.0(ref)
	exposed	450/428	1.5 (1.3-1.8)	263/292	1.8 (1.4-2.2)	110/133	1.8 (1.4-2.4)
vibration	unexposed	841/1066	1.0(ref)	712/1235	1.0(ref)	692/1509	1.0(ref)
	exposed	314/331	1.3 (1.0-1.6)	144/202	1.2 (1.0-1.6)	61/73	2.0 (1.4-2.9)

These are exposures reported for 5 years before baseline.

All odds ratios are adjusted for age (10 strata), sex, and residential area.

Supplementary Table S4 Association of different types of prolonged repetitive physical workload and risk of rheumatoid arthritis stratified by occupational classes

		Manual Workers		Non-manual Employees	
		cases/controls	OR (95%CI)	cases/controls	OR (95%CI)
repetitive bending/turning	unexposed	204/292	1.0 (ref.)	694/1623	1.0 (ref.)
	exposed	922/1083	1.2 (1.0-1.5)	858/1190	1.6 (1.4-1.8)
repetitive hand/finger movements	unexposed	388/601	1.0 (ref.)	363/818	1.0 (ref.)
	exposed	736/772	1.4 (1.2-1.7)	1187/1994	1.4 (1.2-1.6)
lift or carry more than 10kg	unexposed	233/329	1.0 (ref.)	993/2007	1.0 (ref.)
	exposed	893/1046	1.2 (1.0-1.5)	558/807	1.4 (1.2-1.6)
precision work	unexposed	943/1142	1.0 (ref.)	1415/2597	1.0 (ref.)
	exposed	177/220	0.9 (0.7-1.1)	135/217	1.1 (0.9-1.4)
hands below knee level	unexposed	654/899	1.0 (ref.)	1410/2640	1.0 (ref.)
	exposed	467/473	1.3 (1.1-1.5)	141/171	1.6 (1.2-2.0)
hands above shoulder level	unexposed	573/850	1.0 (ref.)	1320/2554	1.0 (ref.)
	exposed	549/522	1.6 (1.3-1.9)	232/259	1.7 (1.4-2.1)
vibration	unexposed	763/979	1.0 (ref.)	1431/2664	1.0 (ref.)
	exposed	361/389	1.2 (0.9-1.4)	121/149	1.7 (1.3-2.3)

These are exposures reported for 5 years before baseline.

All odds ratios are adjusted for age (10 strata), sex, and residential area.

Supplementary Table S5: Adjusted odds ratios for the association of prolonged repetitive physical workload and development of RA

Exposure*	Potential Confounding Factors						
	Repetitive bending/turning OR* (95%CI)	Repetitive hand/finger movement OR* (95%CI)	Lift or carry More than 10kg OR* (95%CI)	Precision Work OR* (95%CI)	Hands below Knee level OR* (95%CI)	Hands above Shoulder OR* (95%CI)	Vibration OR* (95%CI)
Repetitive bending/turning		1.6(1.4-1.7)	1.5(1.3-1.6)	1.6(1.5-1.8)	1.5(1.4-1.7)	1.4(1.3-1.6)	1.5(1.4-1.7)
Repetitive hand/finger movement	1.2(1.0-1.3)		1.3(1.2-1.5)	1.3(1.2-1.4)	1.3(1.2-1.4)	1.2(1.1-1.4)	1.3(1.1-1.4)
Lift or carry More than 10kg	1.4(1.2-1.5)	1.6(1.4-1.7)		1.5(1.4-1.7)	1.4(1.3-1.6)	1.3(1.2-1.5)	1.5(1.3-1.6)
Precision work	1.0(0.9-1.2)	1.1(0.9-1.3)	1.0(0.9-1.2)		1.0(0.9-1.2)	1.0(0.9-1.2)	1.0(0.8-1.1)
Hands below Knee level	1.4(1.2-1.6)	1.6(1.4-1.8)	1.4(1.2-1.6)	1.6(1.4-1.8)		1.2(1.1-1.4)	1.5(1.3-1.7)
Hands above shoulder	1.6(1.4-1.8)	1.8(1.6-2.0)	1.6(1.4-1.8)	1.5(1.3-1.8)	1.6(1.4-1.8)		1.7(1.5-1.9)
vibration	1.3(1.2-1.5)	1.5(1.3-1.8)	1.3(1.2-1.5)	1.8(1.6-2.0)	1.3(1.1-1.5)	1.2(1.1-1.4)	

*: These are exposures reported for 5 years before baseline.

All odds ratios are also adjusted for age (10 strata), sex and residential area.

Supplementary Table S6: Odds ratios for the association of prolonged repetitive physical workload and development of RA*

Types of Physical Workloads	5 Years Before Baseline
	OR* (95%CI)
repetitive bending/turning	1.3 (1.1-1.4)
repetitive hand/finger movements	1.2 (1.1-1.4)
lift or carry more than 10kg	1.3 (1.1-1.4)
precision work	0.9 (0.7-1.0)
hands below knee level	1.1 (1.0-1.3)
hands above shoulder level	1.4 (1.2-1.6)
vibration	1.1 (0.9-1.3)

These are exposures 5 years before baseline.

*The odds ratios are obtained after all types of physical workload were included simultaneously in the statistical model together with age (10 strata), sex and residential area.