

## work package 2

Attribution of the respective musculoskeletal disorders to occupational stress/risk factors?



WP 2-1: physical factors

WP 2-2: psychosocial factors

WP 2-3: physical and psychosocial factors

## work package 2.1.

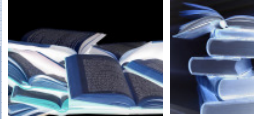
The impact of physical risk factors on MSDs



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## methods

- similar to work package 1
- NIOSH report on musculoskeletal disorders and workplace factors (Bernard, 1997)
- Criteria document for evaluating the work-relatedness of upper-extremity disorders (Sluiter et al., 2001)
- two data bases: pubmed, embase
- keywords and logic operators:
  - musculoskeletal disorders
  - pain symptoms with regard to muscles, bones,
  - msd [mesh], pain [mesh]
  - AND
  - physical exposure (e. g. lift\*, carry\*, bend\*, etc.)
  - AND
  - epidemiologic metric: prevalence\*/incidence\*/risk\* (limit: Title/Abstract)



- limits: human, English/German, Review, period: 2000 - July 2009
- exclusion criteria: intervention analysis, evaluation of preventive programs
- -> 561 hits
- Sorting for double hits
- Scanning of title and abstract
- -> 36 review articles considered for further analysis

	N
0	6
1	12
2	2
3	0
4	2
5	2
6	4
7	2
8	3
9	2
10	1
11	0
	36

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## NIOSH report (Bernard, 1997)

body part	risk factor	strong evidence	evidence	insufficient evidence	body part	risk factor	strong evidence	evidence	insufficient evidence	
neck and neck/shoulder	repetition		X		carpal tunnel syndrome	repetition		X		
	force		X			force		X		
	posture	X				posture				X
	vibration			X		vibration		X		
shoulder	repetition		X		combination	X				
	force			X	tendinitis	repetition		X		
	posture		X		force		X			
elbow	vibration			X	posture		X			
	repetition			X	combination	X				
	force		X		hand-arm vibration syndrome	vibration	X			
	posture			X						
	combination	X								

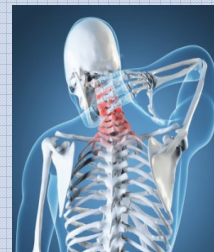
body part	risk factor	strong evidence	evidence	insufficient evidence
back	Lifting/forceful movement	X		
	Awkward posture		X	
	Heavy physical work		X	
	Whole body vibration	X		
	Static work posture			X

criteria document for evaluating the work-relatedness of upper-extremity disorders (Sluiter et al., 2001)

physical factors	neck region	shoulder and upper arm region	elbow and forearm region	wrist and hand region
posture in relation to duration/frequency or both	evidence	evidence	evidence	evidence
force in relation to duration/frequency or both			evidence	evidence
duration of repetitive movements	evidence	evidence	evidence	evidence
vibrating tools			evidence	evidence
combinations of physical factors		evidence	evidence	evidence
cold				evidence

international literature

- MSD of the neck and/or neck/shoulder (6 reviews)
- **NIOSH (evidence: repetition, force; strong evidence: posture)**
  - sedentary activity
  - trunk rotation
  - bending
  - shoulder flexion and abduction
  - inner elbow angle < 121°
  - precision work
  - neck flexion > 20° (> 70% of working hours)
  - mouse position
  - telephone lodged on shoulder



- MSD of the shoulder (8 reviews)
- **NIOSH (evidence: repetition, posture)**
- overhead work
- MSD of the elbow (9 reviews)
- **NIOSH (evidence: force; strong evidence: combination)**
- flexed/turned hands
- precision work
- circular motions/screwing
- arms raised in front of body (> 70% of working hours)
- repetitive arm movements



- MSD of the hand/wrist (14 reviews)
- **NIOSH (evidence: repetition, force, (posture); strong evidence: combinations)**
- repetition
- physical workload
- wrist position
- firm gripping
- forceful movements with flexed/extended wrist, ulnar/radial deviation
- pincer grip
- fingertip pressure
- working with air pressure tools

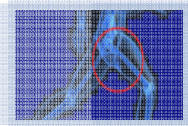


more specific MSDs:

- DeQuervain, extensor carpi ulnaris/radialis tendinopathy, hand-arm-vibration syndrome, peritendinitis/tendinitis/tenosynovitis, dorsal tendon entrapment, trigger finger

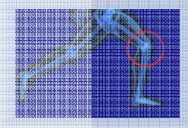
- hip osteoarthritis (6 reviews)

- heavy lifting/carrying (moderate evidence)
- agricultural work (moderate evidence)
- construction work (moderate evidence)



- knee osteoarthritis (5 reviews)

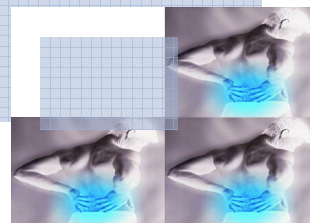
- heavy lifting/carrying (moderate evidence)
- kneeling/squatting (moderate evidence)
- kneeling and heavy lifting (moderate evidence)
- climbing stairs/ladders (limited evidence)



- LBP (15 reviews)

- **NIOSH (strong evidence: lifting/forceful movements, WBV; evidence: awkward posture, heavy physical work; insufficient evidence: static work posture)**

- lifting/forceful work (strong evidence)
- awkward postures (stooping and rotation) (limited evidence)
- vibration (contradictory results)
- sitting and vibration (meta-OR: 2.3)



## work package 2.2.

### The impact of psychosocial/psychological risk factors on MSD



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## background

- the relationship between psychosocial risk factors at work and MSDs is frequently studied (approx. 6000 primary studies)
- available reviews (> 40) do not allow to assess the importance of specific risk factors due to inconclusive and sometimes contradictory findings within the primary studies
- aim:  
=> meta-analysis of the impact of psychosocial risk factors on the development of MSDs by focusing solely on prospective studies

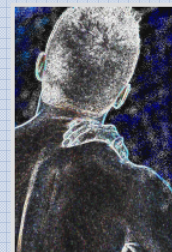
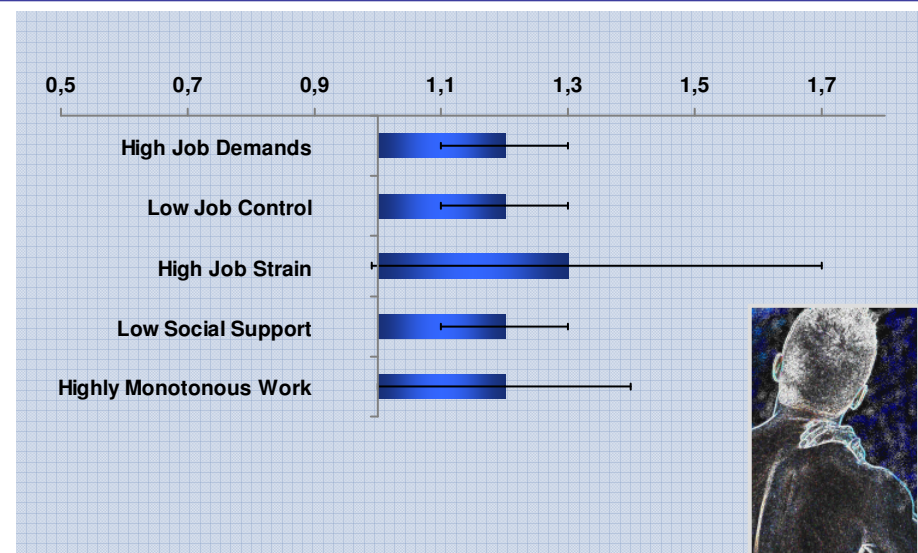
- MEDLINE and PsychINFO (till July 2009)
- combinations of general and specific keywords for musculoskeletal disorders and psychosocial risk factors  
→ 5901 articles
- selection criteria: German or English language, sample from industrialized countries, working population, inclusion of data on the relationship between any psychosocial risk factor and any type of MSD  
→ 249 articles
- full texts screened for longitudinal studies, measuring psychosocial risk factors at time 1 and controlling for MSD symptoms at baseline  
→ 28 articles (out of 74 longitudinal papers)

- data extraction: any reported effect-size indicator
- effect-size metric for meta-analysis: Odds Ratios
- statistical procedure: metafor package in R
- 44 possible effect-sizes for the association between psychosocial risk factors and MSDs
- 16 effect-sizes with  $k > 5$  (leaving 25 articles for inclusion)

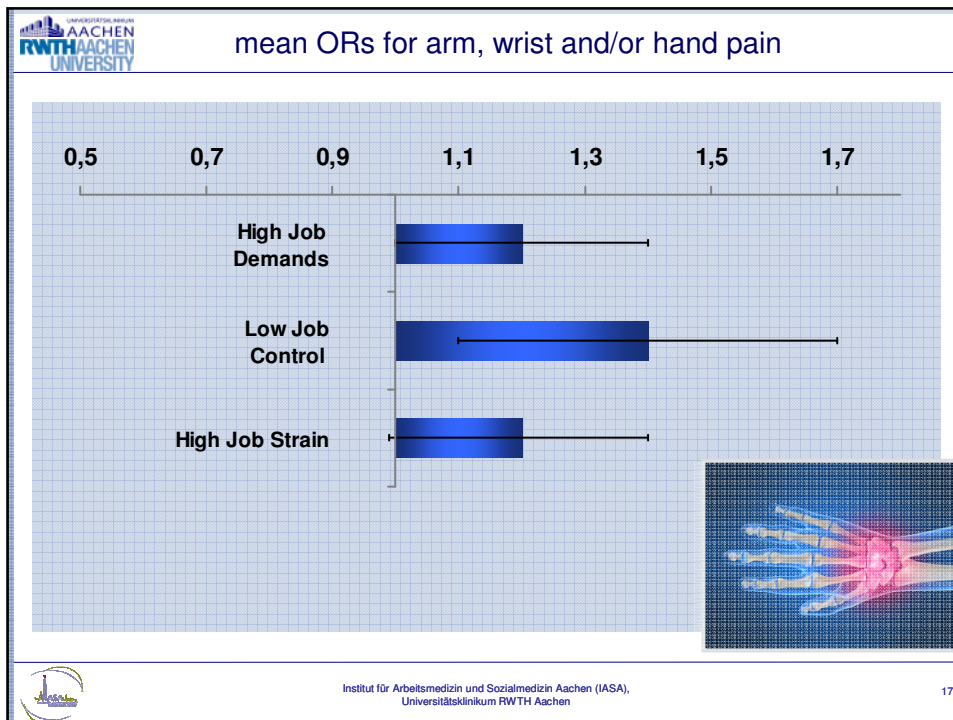
### mean ORs for low back pain



### mean ORs for neck and/or shoulder pain







- discussion
- several psychosocial workplace stressors have a long-term impact on the development of musculoskeletal symptoms
  - for example, high monotonous work, low social support from supervisors and colleagues, job insecurity as well as high job demands seem to increase the risk for the development of LBP
  - the nature of the primary studies did not allow differentiation regarding specific occupations and/or occupational tasks
  - no conclusion possible for more specific MSDs
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- 18

- more prospective studies to allow for a differentiation of risk factors according to specific musculoskeletal problems
- more prospective studies to allow for moderator analyses considering specific occupations, job settings and worker characteristics
- refuse to dichotomize relevant variables to prevent information loss and thus underestimation of lagged effects
- use of true cross-lagged panel designs with predictor and criterion measures assessed at both time points to allow for conclusions on the causal mechanism behind the relationship

## work package 2.3.

The impact of physical and psychosocial risk factors on MSD



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## background and methods

### previous work packages:

- development of MSDs due to ...
  - ... physical risk factors
  - ... psychosocial risk factors



### research questions:

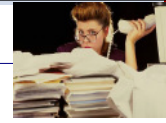
- what impact has the exposure to both physical and psychological risk factors in the workplace on the development of MSDs?
- are physical and psychological risk factors independent from each other?

### methods

- literature search of work package 2.2. screened for physical and psychosocial risk factors
  - studies selected, adjusting for physical factors in the analysis of psychosocial risk factors
- => 16 longitudinal studies

## impact of controlled psychosocial risk factors on MSDs

psychosocial risk factors	effect sizes	location
job demands	RR = 2.14, 95% CI 1.27–3.60	LBP; neck/shoulder pain
job control	RR = 1.20, 95% CI 1.01–1.42	LBP; neck/shoulder pain
job strain (high demand & low control)	OR = 1.61, 95% CI 1.20–2.17 RR = 1.62, 95% CI 1.03–2.53,	neck/shoulder pain
mental load	OR = 1.60, 95% CI 1.10–2.30	LBP
job intensity	OR = 1.80, 95% CI 1.40–2.30	LBP
organizational demands (time pressure)	OR = 1.60, 95% CI 1.30–2.10	LBP
social support from superiors and colleagues	OR = 3.40, 95% CI 1.60–7.30 RR = 2.46, 95% CI 1.17–5.19 RR = 1.20, 95% CI 1.02–1.42	LBP; neck/shoulder pain
job satisfaction	OR = 1.70, 95% CI 1.30–2.10	LBP; neck/shoulder pain
monotonous work	OR = 1.70, 95% CI 1.10–2.80 OR = 1.80, 95% CI 1.10–2.80	LBP; neck/shoulder pain
sleep disturbance	OR = 2.30, 95% CI 1.30–4.30	LBP
stress	OR = 4.70, 99% CI 1.60–14.30	LBP
health behaviour	OR = 2.80, 95% CI 1.40–5.40	LBP



- physical and psychological risk factors for MSDs seem to be independent factors.
- psychosocial factors seem to have an incremental effect on the occurrence of pain and complaints of the musculoskeletal system.
- psychosocial factors might be able to moderate the effect of physical factors
- due to limited data on the relationship between physical and psychological risk factors with regard to the development of MSDs, it is not currently possible to create a ranking for the association between combined exposure to physical and psychosocial stressors at the workplace and the occurrence of MSD.

1. Lumbar spine – metalworking occupations
2. Lumbar spine – transport and warehouse occupations
3. Lumbar spine – construction occupations
4. Lumbar spine – law enforcement and security occupations
5. Lumbar spine – health service
6. Shoulder and neck complaints – metalworking occupations
7. Shoulder – construction occupations
8. Tenosynovitis, synovitis, CTS – office occupations
9. Enthesopathies – assembly line workers (especially in meat/fish production)
10. Hip and knee joint arthrosis – agricultural occupations and forestry workers

## “transitory” ranking

1. Lumbar spine – heavy lifting and carrying
2. Lumbar spine – posture
3. Lumbar spine – heavy labor
4. Lumbar spine – whole body vibration when seated
5. Neck/shoulder pain – sedentary activity with neck flexion > 20°
6. Shoulder MSDs – combined stress of force and posture or force and rotation
7. CTS hand/wrist MSDs – combined stresses of force and repetition
8. Epicondylitis – combined stresses of repetition and force or posture and force
9. Knee osteoarthritis – combined stress of force and posture
10. Hip osteoarthritis – heavy lifting and carrying

## “transitory” ranking\*

- 1) monotonous job conditions
- 2) social support (especially from supervisors)
- 3) job insecurity
- 4) job demands
- 5) job control  
(job demands and job control form job strain as a risk factor)

\* this „ranking“ should be interpreted with caution as the confidence intervals of the mean odds ratios show a huge overlap and thus do not allow any order of importance.

**Thank you for your attention.**



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