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,
- 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

NIOSH report (Bernard, 1997)

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<td>Static work posture</td>
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criteria document for evaluating the work-relatedness of upper-extremity disorders (Sluiter et al., 2001)

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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, periandinitis/tendinitis/tenosynovitis, dorsal tendon entrapment, trigger finger
international literature

• 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)

international literature

• 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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\textsuperscript{1}Institute of Occupational and Social Medicine, RWTH Aachen University, Germany
\textsuperscript{2}Faculty of Psychology and Neuroscience, Maastricht University, NL

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
literature research

- 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)

methods

- 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

- High Job Demands
- Low Job Control
- High Job Strain
- Low Social Support
- Low Supervisory Support
- Low Job Satisfaction
- Low Job Security
- Highly Monotonous Work

mean ORs for neck and/or shoulder pain

- High Job Demands
- Low Job Control
- High Job Strain
- Low Social Support
- Highly Monotonous Work
**mean ORs for arm, wrist and/or hand pain**

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<td><strong>Low Job Control</strong></td>
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<td><strong>High Job Strain</strong></td>
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**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
future research

- 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

<table>
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<tr>
<th>psychosocial risk factors</th>
<th>effect sizes</th>
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<td>job demands</td>
<td>RR = 2.14, 95% CI 1.27–3.60</td>
<td>LBP: neck/shoulder pain</td>
</tr>
<tr>
<td>job control</td>
<td>RR = 1.20, 95% CI 1.01–1.42</td>
<td>LBP: neck/shoulder pain</td>
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<tr>
<td>job strain (high demand &amp; low control)</td>
<td>OR = 1.61, 95% CI 1.20–2.17, RR = 1.62, 95% CI 1.03–2.53</td>
<td>neck/shoulder pain</td>
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<tr>
<td>mental load</td>
<td>OR = 1.60, 95% CI 1.10–2.30</td>
<td>LBP</td>
</tr>
<tr>
<td>job intensity</td>
<td>OR = 1.80, 95% CI 1.40–2.30</td>
<td>LBP</td>
</tr>
<tr>
<td>organizational demands (time pressure)</td>
<td>OR = 1.60, 95% CI 1.30–2.10</td>
<td>LBP</td>
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<tr>
<td>social support from superiors and colleagues</td>
<td>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</td>
<td>LBP: neck/shoulder pain</td>
</tr>
<tr>
<td>job satisfaction</td>
<td>OR = 1.70, 95% CI 1.30–2.10</td>
<td>LBP: neck/shoulder pain</td>
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<td>monotonous work</td>
<td>OR = 1.70, 95% CI 1.10–2.80, OR = 1.80, 95% CI 1.10–2.80</td>
<td>LBP: neck/shoulder pain</td>
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<tr>
<td>sleep disturbance</td>
<td>OR = 2.30, 95% CI 1.30–4.30</td>
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<tr>
<td>health behaviour</td>
<td>OR = 2.80, 95% CI 1.40–5.40</td>
<td>LBP</td>
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Institut für Arbeitsmedizin und Sozialmedizin Aachen (IAS A),
Universitätsklinikum RWTH Aachen

**Conclusion**

- 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.

**“Transitory” Ranking**

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. Tendinitis, synovitis, CTS – office occupations
9. Enthesopathies – assembly line workers (especially in meat/fish production)
10. Hip and knee joint arthritis – 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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