

Lumbar discal herniation as occupational disease in Germany

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Outline



- Introduction: Work-related MSDs in Germany
- Lumbar discal herniation as occupational disease (OD) in Germany
 - History and definitions
 - Pathomechanism and epidemiology
 - Exposure and medical criteria
 - General criteria for acceptance
- Practical issues
 - Anamnesis software/data bases
 - Research activities: situational lumbar loads, job/task exposures and dose-response relationship

Work-related MSDs in Germany





- Approx. 23.3 % of all sick leave due to MSDs*
- Approx. 26 000 new invalidity pensions due to MSDs*
- Costs of loss of production -caused by MSDs - are estimated to be 9.1 Bn €/a*
- → MSD prevention is one of the OSH objectives in the "Common German Occupational Safety and Health Strategy" – "GDA"
- → DGUV prevention campaign on MSD in 2013

*German OSH Report 2010

MSDs as occupational diseases in Germany









- Upper limb:
 - Diseases due to overstraining tendon sheaths, peritendineum or muscular and tendonous insertions (2101)
 - Osteoarticular diseases of the hands and wrists caused by mechanical vibration (2103)
 - Carpal Tunnel Syndrome CTS (21XX)
- Snine
 - Intervertebral disc-based diseases of the lumbar or cervical spine (2108, 2109, 2110)
- Lower limb:
 - Meniscus lesions (2102)
 - Knee osteoarthritis (2112)

Degenerative lumbar discal diseases as occupational disease (OD) in Germany



History

before re-unification of the 2 parts of Germany:

Federal Republic of Germany [West]: German Democratic Republic [East]:

no "occupational disease"

OD "Denerative diseases of the spine caused by mechanical overload for many years ..."

Degenerative lumbar discal diseases as occupational disease (OD) in Germany



Occupational disease OD 2108

1993: Introduction of OD 2108

"Intervertebral disc related diseases of the lumbar spine

caused by lifting or carrying of heavy loads for many years or

caused by work-related activities in extremely trunk-flexed postures for many years..."

Degenerative lumbar discal diseases as occupational disease (OD) in Germany



Occupational disease OD 2110



1993: Introduction of OD 2110

"Intervertebral disc related diseases of the lumbar spine

caused by whole-body vibrations (mainly vertical vibrations in sedentary postures) for many years ..."

Pathomechanism – OD enactment Lumbar discal diseases as OD in Germany



- Nutrition of intervertebral discs:
 - Diffusion process can be affected by long-term mechanical load exposures and/or exertions to whole-body vibrations
 - Possible disturbances of metabolism
- Intervertebral disc compression forces:
 - Manual material handling activities and/or working in awkward postures lead to high lumbar disc compression forces that may lead to irreversible damage of discal tissue

Epidemiology – OD enactment Lumbar discal diseases as OD in Germany



· Health care studies, e. g.

Videman et al. 1984 nursing aides vs. qualified nurses

RR 2.8: chronic LBP

RR 1.6: sick leave due to LBP RR 1.7: bed rest due to LBP

RR 4.5: disability pension due to degenerative lumbar discal disease

Exposure: Lifting 4.8 vs. 1.8 h / week
Trunk bending/rotation 11.9 vs. 3.7 h / week

Hofmann et al. 1995 sick nursing / elderly care vs. controls

OR 3.4: disc herniation / -protrusion

average exposure time: 19.3 + 11.8 yrs.

Epidemiology

Lumbar discal diseases as OD in Germany



• Studies in the construction sector, e. g.

Riihimäki 1985, ~ et al. 1989 concrete reinforcement workers vs. house painters

RR 1,5: Wirbelkörper-"Randzacken" (spondylosis)

RR 1,8: disc narrowing (chondrosis)

RR 1,9: end-plate sclerosis (osteochondrosis)

Exposure Lifting >20kg: 5/h; 5-20kg: 13/h

Wickström Carrying for 2 of 3 liftings

et al. 1985 trunk bent: >90°(12%); 15-90°(18%) bent+twist: >90° (2%); 15-90° (3%)

average concrete reinforcement work: 14.6 + 6.4 yrs. exposure + other construction work: 4.2 yrs. time + agricultural work: 4.2 yrs.

Epidemiology Lumbar discal herniation as OD in Germany



• Studies in trade and logistic sectors, e. g.

harbour

Lawrence 1955 dockers vs. office workers

RR 6,2: moderate / severe radiological lumbar changes

exposure time: > 11 years

Mach et al. 1976 port handling workers vs.

white collar workers

RR 2,0: degenerative spinal changes

average exposure duration: 6,2 years

Exposure criteria – OD enactment OD 2108

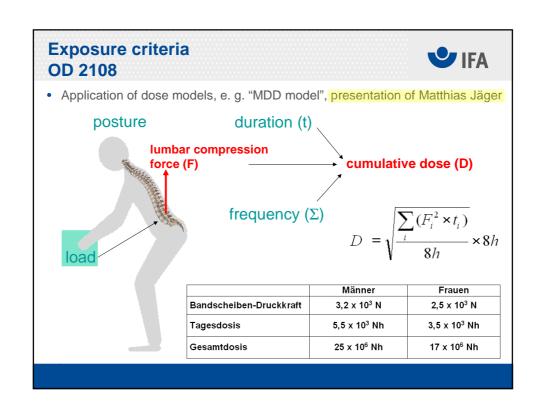


• Risk assessment for load weights (kg) and action forces (N)

Task	female	male
Bi-manual lifting Lifting with one hand Bi-manual load transfer (ideal posture) Load transfer with one hand (ideal posture) Bi-manual carrying besides the body, on the shoulders or back Onesided carrying	10 kg 5 kg 20 kg 5 kg 20 kg 15 kg	15 kg 10 kg 30 kg 10 kg 30 kg 25 kg
Pulling Pushing	250 N 300 N	350 N 450 N

- Regulary manual material handling per workshift, e. g. 250 lifting or transfer activities or 30 minutes carrying tasks per workday, consideration of postures!
- Or: Working in awkward trunk bending postures for relevant durations
- Exposure exertion for many years, e. g. 10 years with more than 60 shifts per year





Occupational Disease 2110 (WBV)



Dose-response relationship – Step 1: daily exposure $A_1(8)$

$$A_{\rm I}(8) = k_{\rm I} \sqrt{\frac{1}{8h} \sum_{i} a_{{\rm wl},i}^2 T_i}$$

- energy-equivalent average
- I={x,y,z} Vibrational direction (predominantly z)
- $k_x=k_v=1,4$ $k_z=1,0$ constant (sensitivity towards sinusoidal vibration)
- a_{wl} frequency-weighted acceleration
- T daily exposure time
- *i* exposure

Take $A_z(8)$ (or largest $A_l(8)$) and count all days with $A_l(8)>0.63$ ms⁻²

Occupational Disease 2110 (WBV)



Dose-response relationship – Step 2: lifetime exposure DTake $A_z(8)$ (or largest $A_1(8)$) and count all days with $A_1(8) > 0.63$ ms⁻²

$$D = \sum_{i} A_{i}^{2}(8)$$
 $D_{\text{Limit}} = 1450 \left(\frac{\text{m}}{\text{s}^{2}}\right)^{2}$

- \bullet Limit exposure $D_{\rm Limit}$ from Rheinbraun-Study, whole-body vibration study of DGUV
- Outcome low-back pain as lowest level for occ. diseases 2110 (chondrosis, herniation ...). The larges A_I(8) is relevant.
 Notbohm, Schwarze, Albers, Arbeitsmed. Sozialmed. Umweltmed, 44-6 (2009) 327-335.

Medical criteria Lumbar discal diseases as OD in Germany



 e. g. lumbar discal herniation and/or protrusion, with sensitive and/or motor radix syndrom or with local lumbar syndrom



- Medical history/anamnesis
- Diagnosis of lumbar disc herniation has to be confirmed by CT or MRI
- Chronic recurrent complaints and functional impairments, atypical age-related diagnosis
- Consistency of clinical and radiological findings
- Disease is not therapeutically curable, respective working tasks have to be discontinued
- Consideration of competing factors, e. g. scoliosis, Bektherev's disease

Medical criteria Lumbar discal diseases as OD in Germany



• Severe disc narrowing (more than one third compared with adjacent unchanged discs) with sensitive and/or motor radix syndrom or with local lumbar syndrom



- Medical history/anamnesis
- Diagnosis of lumbar disc herniation has to be confirmed by CT
- Chronic recurrent complaints and functional impairments, atypical age-related diagnosis
- Consistency of clinical and radiological findings
- Disease is not therapeutically curable, respective working tasks have to be discontinued
- Consideration of competing factors, e. g. scoliosis, Bektherev's disease

Medical criteria Lumbar discal diseases as OD in Germany



• Results of German consensus group of the DGUV

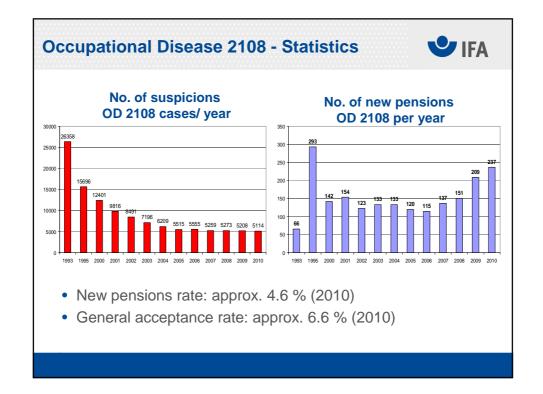
	Konsensempfehlungen
Trauma Berufskrankh 2005 - 7:211 – 252 DOI 10.1007/s10039-005-1027-5 Online publicate: 4. August 2005 © Springer Medizin Verlag 2005	U. Bolm-Audorff - S. Brandenburg - T. Brüning - H. Dupuis - R. Ellegast - G. Elsner K. Franz - H. Grasshoff - V. Grosser - L. Hanisch - B. Hartmann - E. Hartman' G. Heuchert - M. Eiger - J. Krämer - A. Kranig - K. G. Hering - E. Ludolph A. Luttmann - A. Nienhause - W. Pieper - K. D. Pöhl - T. Remé - D. Riede - G. Rompe K. Schälling - E. Schmitt - F. Scröter - A. Seidler - M. Spallek - M. Weber (näher - Appelan - Kuroenvergeline)

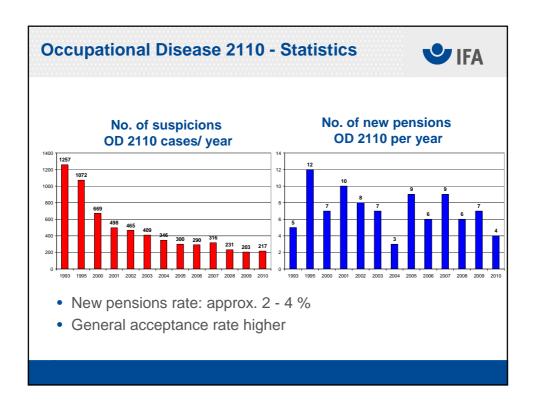
Medical evaluation criteria for occupational diseases of the lumbar spine related to the intervertebral disc

Consensus recommendations for assessing the interrelationship as proposed by the interdisciplinary working group established by HVBG/DGUV.

Vorbemerkungen	nische Beurteilungskriterien bei den Be- rufskrankheiten der Lendenwirbelsäule"	lichen Berufskrankheitentatbestände ent- halten keine eindeutigen Abgrenzungskri-
In den Ausgaben 3 und 4/2005 der Zeit-	veröffentlicht.	terien. Dies gilt sowohl für die Frage, wel-
schrift "Trauma und Berufskrankheit"	Seit ihrem Inkrafttreten Anfang 1993	che Dosis schädigender Einwirkungen
werden die Ergebnisse einer auf Initiati-	haben die Berufskrankheiten Nr. 2108–	für die Verursachung dieser Erkrankun-
ve und mit Unterstützung des Hauptver-	2110 (bandscheibenbedingte Wirbelsäu-	gen ausreicht, als auch für die Frage eines
bandes der gewerblichen Berufsgenos-	lenerkrankungen der Lendenwirbelsäu-	belastungskonformen Krankheitsbildes so-

Bolm-Audorff U. et al. (2005) Medical evaluation criteria for occupational diseases of the lumbar spine related to the intervertebral disc (Part 1+2). Consensus recommendations for assessing the interrelationship as proposed by the interdisciplinary working group established by HVBG/DGUV. Trauma und Berufskrankheiten 7, 211-252 (Part I) and 320-332 (Part 2)



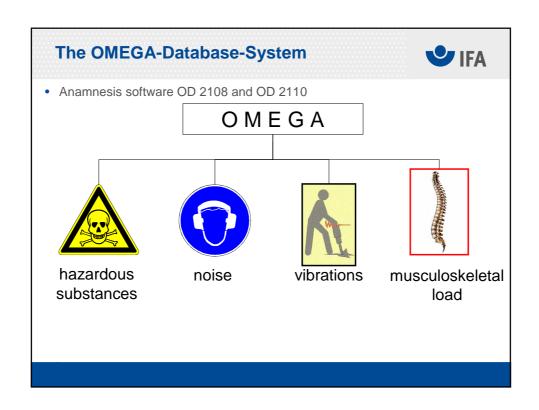


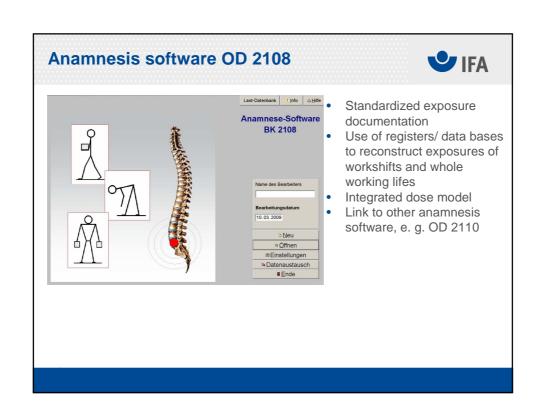
General criteria Lumbar discal herniation as OD in Germany

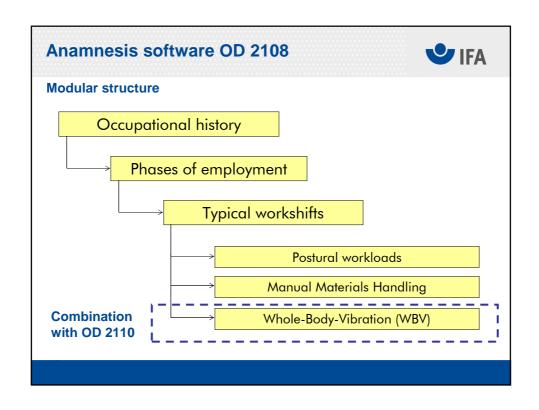


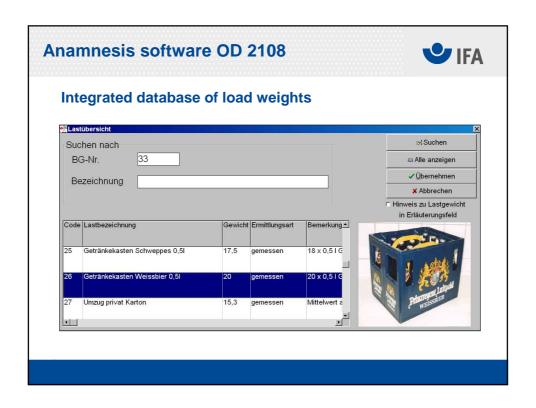
- Constraint for job termination (exception: ergonomic work design to reduce workloads)
- Compensation claims dependant on degree of disability:

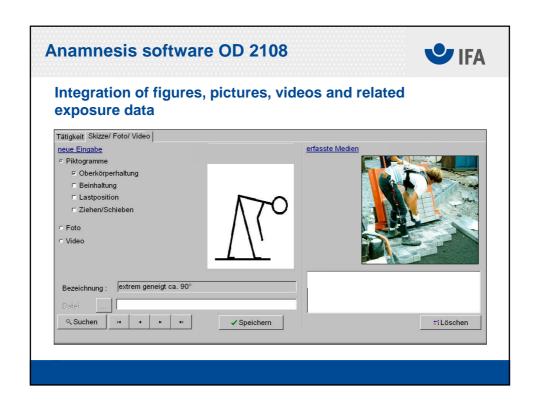
Category	1	2	3	4
Reduction in physical capacity	low	medium	high	very high
Reduction in earning capacity acc. to diagnosis	10 %	20 %	30-40 %	≥50 %
Functional reduction regarding workload	Frequent: - working in trunk-flexed postures - manipulating heavy objects - high loading due to WBV	Long-term constrained sedentary or standing postures More than occasional: - working in trunk- flexed postures - manipulating heavy objects	Occasional: - working in trunk- flexed postures - manipulating heavy objects	Extensive limitations regarding: - materials handling - walking, standing - working in trunk-flexed postures - kneeling, crouching - working overhead - sedantary work - WBV

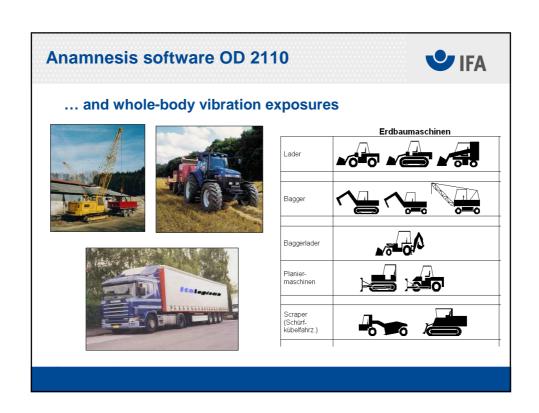




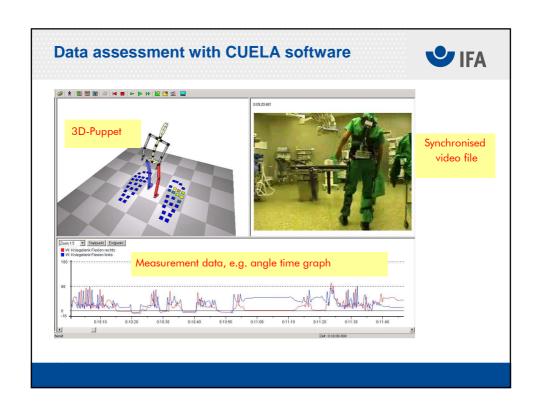




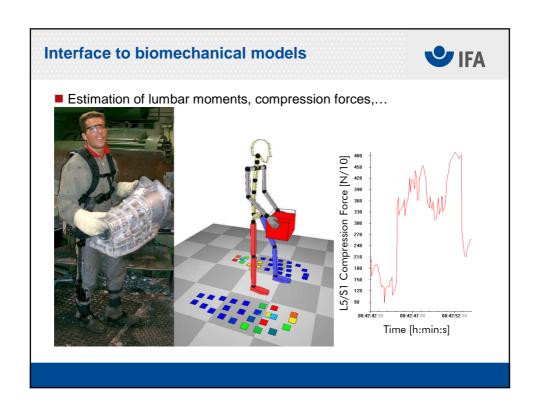












e. g. lumbar load determination during shoveling work* * cooperation with Matthias Jäger

Outlook: German Spine Study "EPILIFT"



Epidemiological multi-center case-control study that aimes to estimate the dose-response relationship between occupational exposure to physical loads and lumbar discal diseases

→ presentation of Matthias Jäger

