

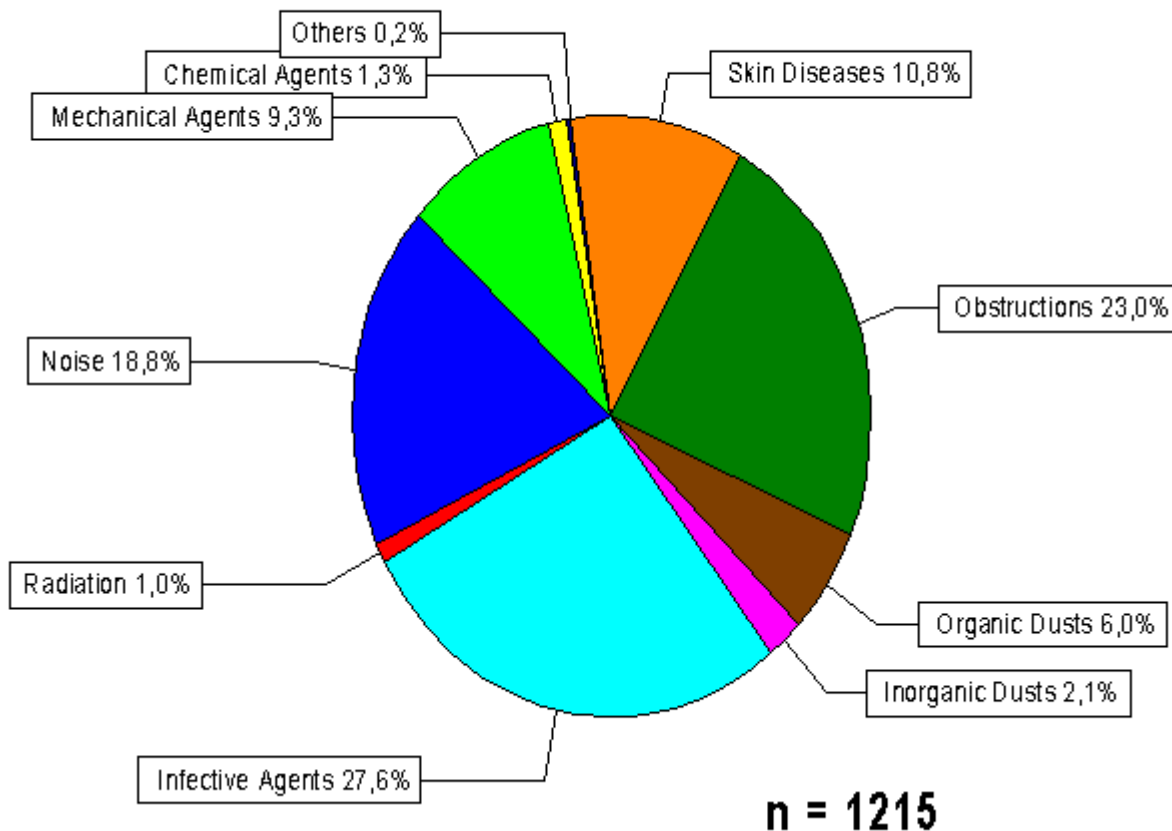
Evaluation of Physical Hazards at Workplaces in Agriculture

Dr Detlev Mohr, Director of the Landesinstitut für Arbeitsschutz und Arbeitsmedizin
Potsdam

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In the Occupational Health Framework Directive 89/391/EEC the fundamental obligations to encourage improvements in the safety and health of workers at work are determined. The employers have the obligation to identify the risks at work and to eliminate these risks. If that is not possible, they have to assess the remaining risks and to minimize them. In agriculture physical hazards are the main risks. Manual handling of loads, whole-body vibration, noise and other physical agents combined with long working times cause a lot of injuries and occupational diseases especially in this sector of the economy.

Diseases with Occupational Origin in German Agriculture 1996

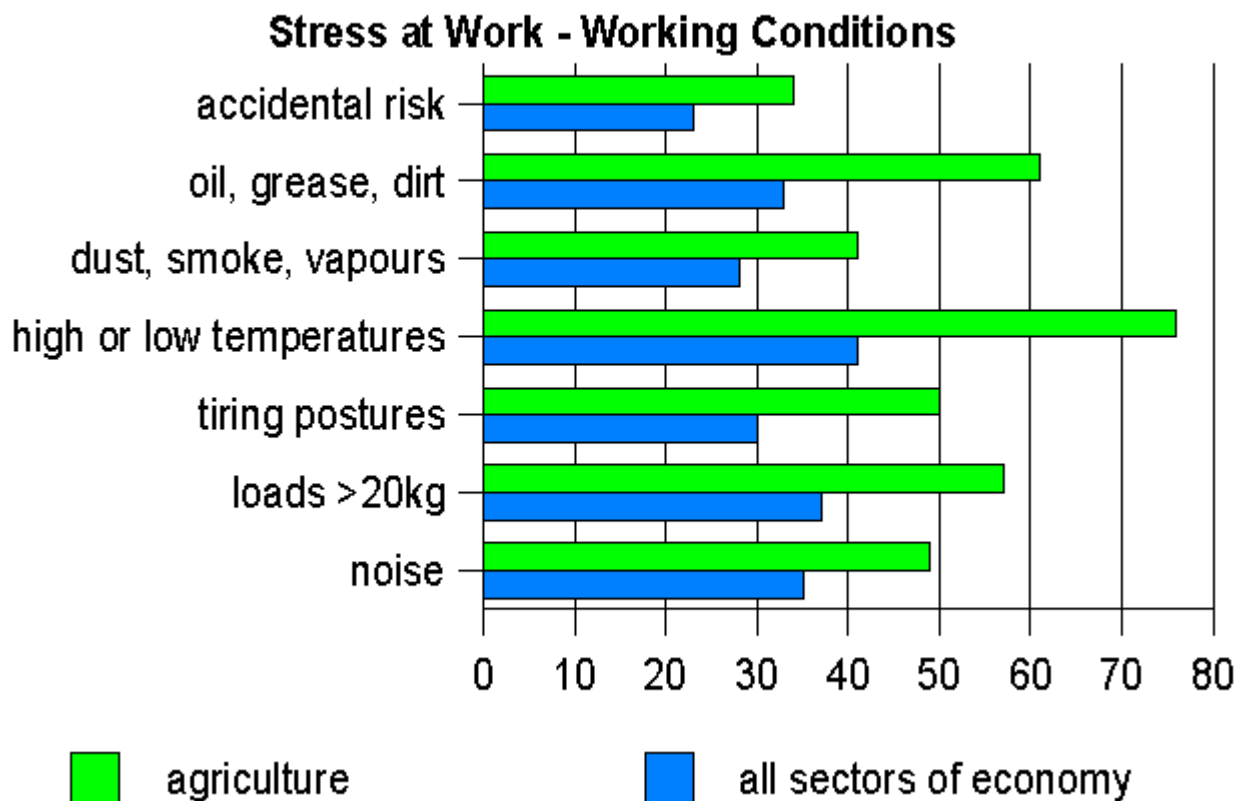


There are only a few actual objective data for stress at work in agriculture available. It is not easy to measure the risks because the working conditions in the agricultural enterprises and the activities of the working population are much more different now than in industry or in agriculture of former GDR. Therefore often subjective data are used to describe the objective working conditions. In Germany we know only three sources of representative data on the state of occupational health and safety at work

the questioning of the Federal Institute of Vocational Education (BiBB/IAB) in 1992 (it was a questioning of employees) the European Survey on Working Conditions ESWC done by the European Foundation for the Improvement of Living and Working Conditions in 1996 (it was a questioning of employees too) and the voluntary questioning of enterprises in Land Brandenburg done by our Institute of Occupational Health and Safety in Potsdam in 1996. (it was a questioning of employers).

I want to show you now some results of these studies with subjective data.

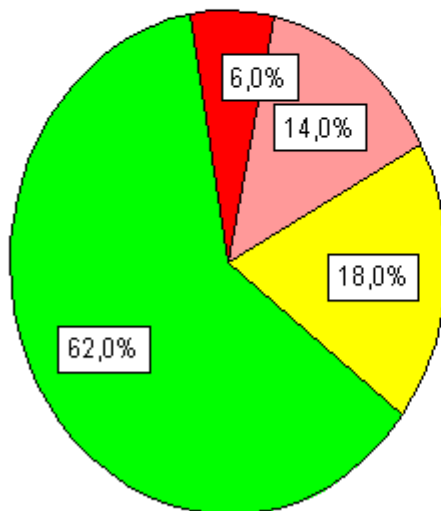
Questioning of Workers in East Germany 1992



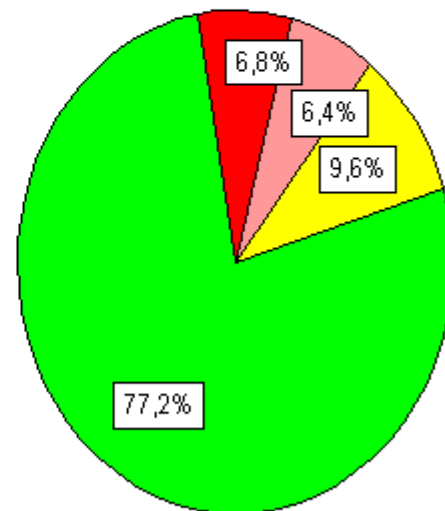
The questioning of 10.000 employees by the Federal Institute of Vocational Education in 1992 has shown that in agriculture more workplaces are characterized by much more noise, much more handling of heavy loads, much more tiring working postures and much more unfavourable climate than in other sectors of economy.

European Survey on Working Conditions (Germany 1996)

Workers Exposed to Noise



Agriculture

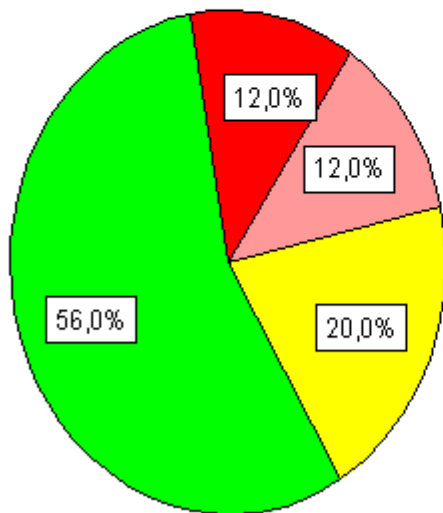


Whole Economy

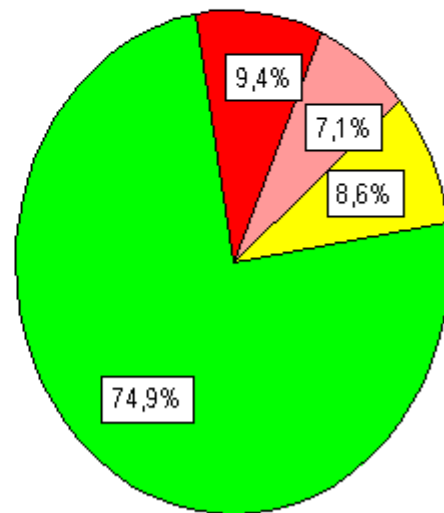
The European Survey on Working Conditions in 1996 has shown that in agriculture a greater percentage of workers is exposed to noise and that these workers have longer exposure durations per day than in the whole of the economy.

European Survey on Working Conditions (Germany 1996)

Workers Exposed to Vibration



Agriculture

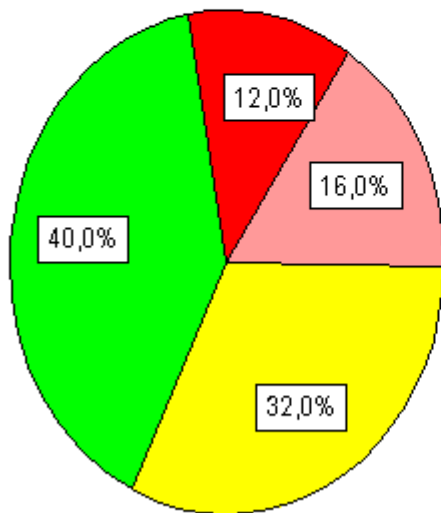


Whole Economy

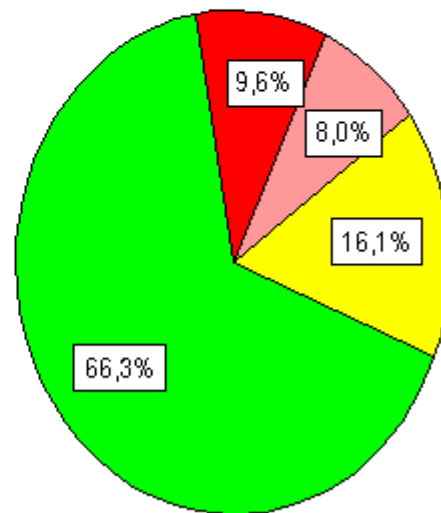
The same situation was found for the exposure to vibration.

European Survey on Working Conditions (Germany 1996)

Workers who have to lift or move heavy loads



Agriculture

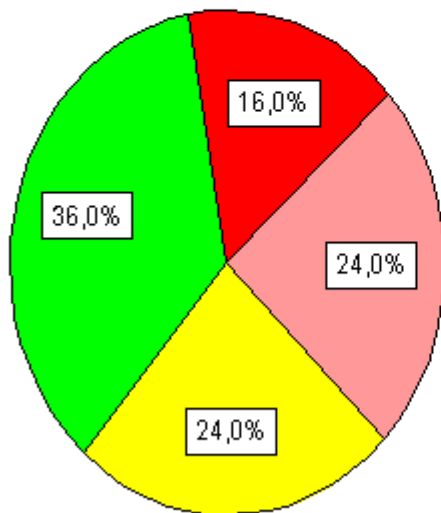


Whole Economy

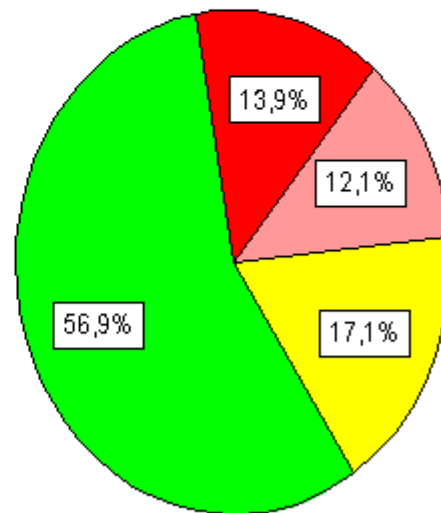
In agriculture a bigger part of workers has to lift or to move heavy loads than in other sectors of the economy. They have also to do these heavy working activities longer than their colleagues. Only 40% of the working population in agriculture is not exposed but 2/3 in the other parts of the economy.

European Survey on Working Conditions (Germany 1996)

Workers who have to work in painful or tiring positions



Agriculture

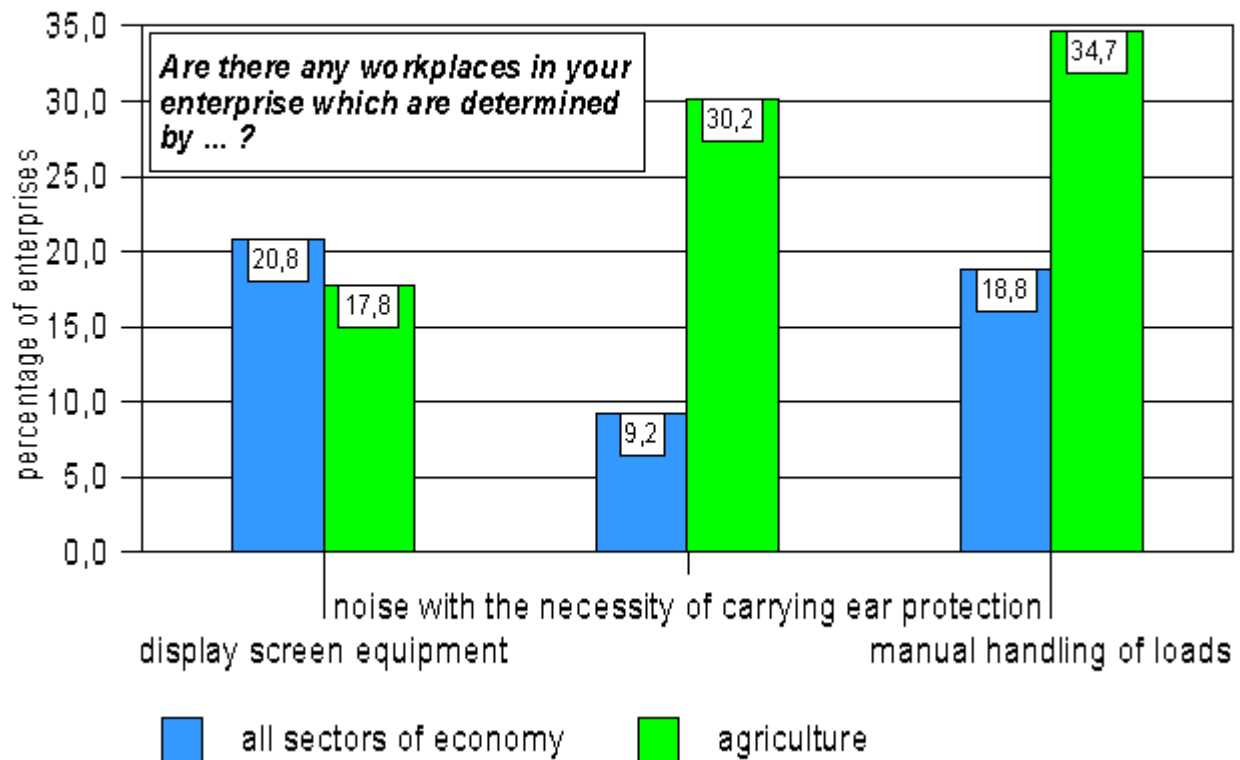


Whole Economy

In agriculture 64% of the workers have to work in painful or tiring positions.

voluntary questioning of 27.391 enterprises

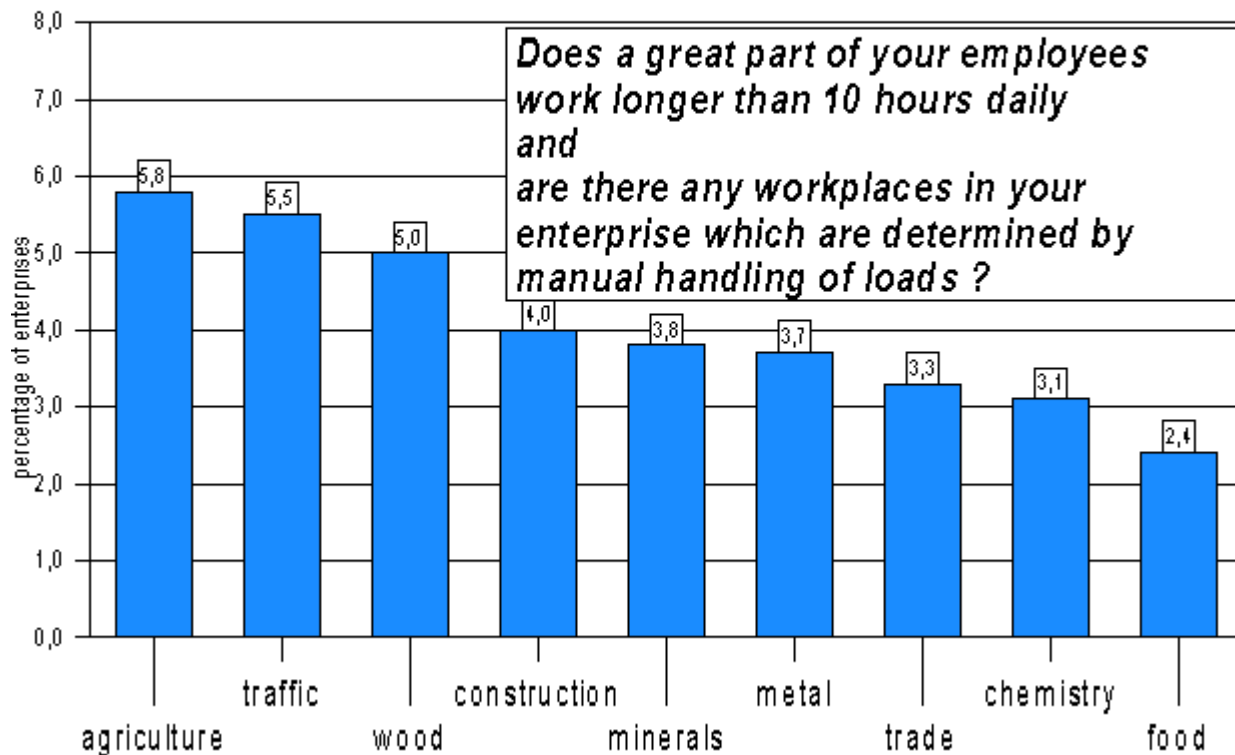
about working conditions in Land Brandenburg in September 1996



Nearly 20% of the enterprises of all economic sectors but 35% of the agricultural enterprises in the German Land Brandenburg answered in a voluntary questioning of the employers that they have workplaces which are determined by manual handling of loads. Manual handling of loads combined with long working times is a considerable risk for the lumbar spine.

voluntary questioning of 27.391 enterprises

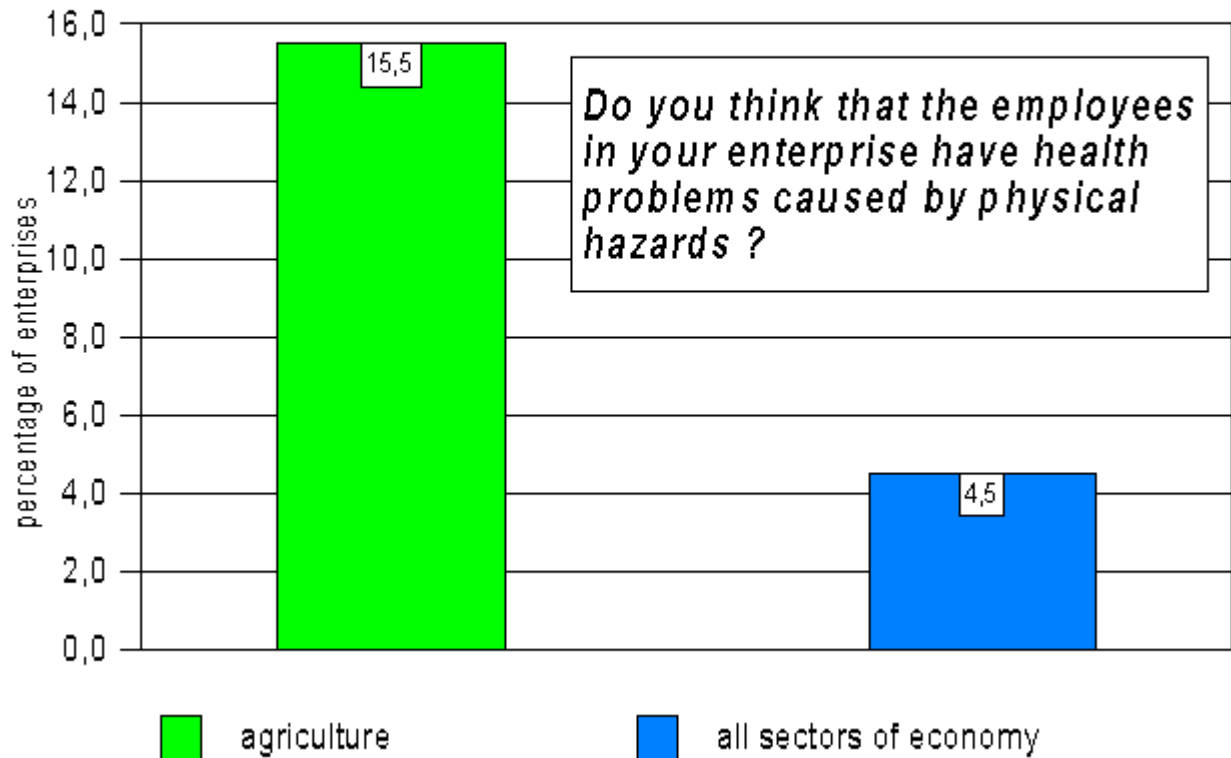
about working conditions in Land Brandenburg in September 1996



Answers to questions about the combined stress caused by manual handling of loads and working times longer than 10 hours daily show that especially this is a risk factor in agriculture.

voluntary questioning of 27.391 enterprises

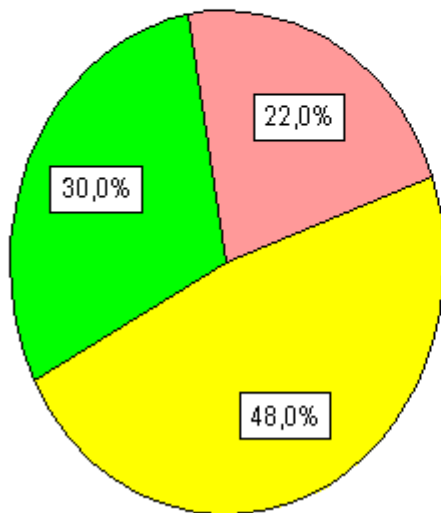
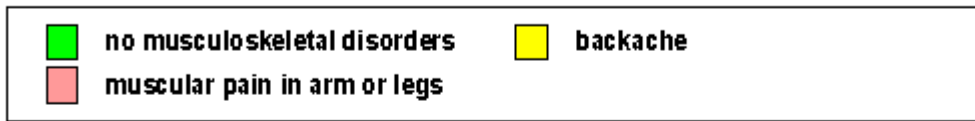
about working conditions in Land Brandenburg in September 1996



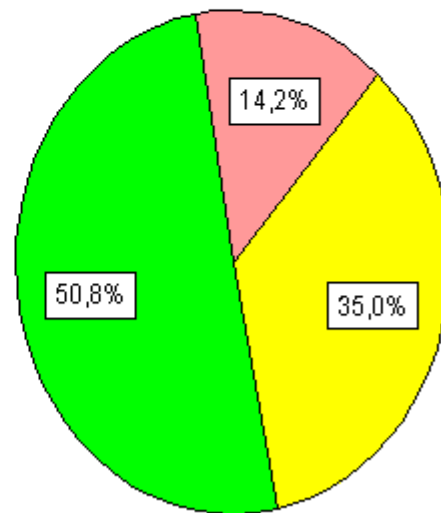
15.5% of the employers in agriculture think that their employees have health problems caused by physical hazards. In all sectors of the economy together only 4.5% of the employers think so.

European Survey on Working Conditions (Germany 1996)

Workers with Musculoskeletal Disorders



Agriculture

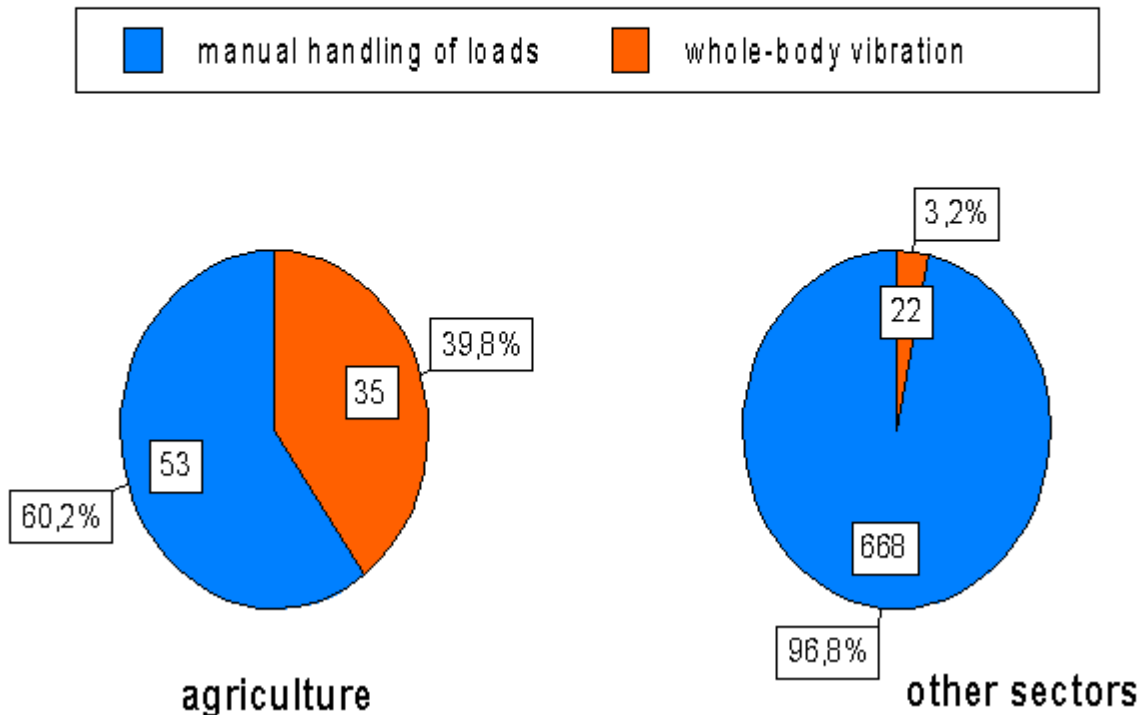


Whole Economy

In the questioning of the employees only 30% of the workers said that they do not have any negative health effects. 48% of the agricultural workers complain of backache. In all sectors of the economy one half of the workers has no musculo-skeletal disorders and only 35% complain of backache.

Diseases with Occupational Origin in 1996

Diseases of the Lumbar Spine



In 1996 occupational diseases of the lumbar spine related to work were found in German agriculture in 88 cases. 53 times the manual handling of heavy loads was accepted as the cause for a vertebral disc related illness. 35 times the cause was whole-body vibration, much more than in other sectors. Long lasting physical work has got an important influence on the state of health. Manual handling of loads is a problem in every economic sector. You see that in agriculture it is one of the main problems.

Therefore I like to introduce to you our new German guideline for the assessment of working conditions during the manual handling of loads, the so called KEY ITEM METHOD.

Fundamental Prevention Measures

1. **minimize the loads to handle
(minimizing of axial pressure forces)**
2. **lift the loads in an upright posture
(preservation of spine spring function, better distribution of forces)**
3. **pick up and put down the loads close to the front of the body
(avoidance of rotational and shearing forces in the spine)**
4. **minimize the distance and the duration of carriage
(maintenance of the intervertebral disc supply with nutrients)**
5. **avoid picking up loads with a jerk
(preservation of the annulus fibrosus of intervertebral disc)**

From the biomechanics you can derivate the following principles to the behaviour in case of handling loads:

- For minimizing the axial pressure forces you have to minimize the loads to handle.
- For preserving the spring function of the spine and to improve the distribution of inner forces you have to lift the loads in an upright posture.
- For avoiding rotational and shearing forces in the spine you have to pick up and put down the loads close to the front of the body.
- For preserving the annulus fibrosus of the intervertebral disc you have to avoid picking up loads with a jerk.
- For maintaining the intervertebral disc supply of nutrients you have to minimize the distance and the duration of carrying.

Now to the work sheet of the screening method. The key items are derived from the biomechanics of the spine or from the annex of the Council Directive. The four key items are the time or frequency of handling of loads, the loads themselves, the posture and the working conditions.

1st step: Estimation of time weight

regular repetition of short	longlasting holding and carrying	time
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lifting or moving processes		weight
< 10 times per work shift	total time < 30 min	1
10 to < 40 times per work shift	total time 30 min to < 1 hour	2
40 to < 200 times per work shift	total time 1 hour to < 3 hours	4
200 to < 500 times per work shift	total time 3 hours to < 5 hours	6
500 times per work shift	total time 5 hours	8

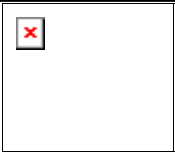

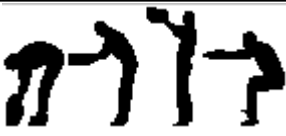
The first step is the estimation of the time weight with the help of this table. The left column has to be applied in cases of repeated handlings, the second column in cases of long lasting carrying.

2nd step: Estimation of load weight

load weight for men	load weight for women	load weight
< 10 kg	< 5 kg	1
10 to < 20 kg	5 to < 10 kg	2
20 to < 30 kg	10 to < 15 kg	4
30 to < 40 kg	15 to < 25 kg	7
40 kg	25 kg	10

The second step is the estimation of the load weight. It depends on the real weight and the gender of the worker.

3rd step: Estimation of posture weight

posture, position of load		posture weight
	- trunk is upright, not twisted - load is close to the body - standing or walking a few steps	1
	- slight bending forward or twisting the trunk - load is nearby the body - sitting, standing or walking for longer distances	2
	- deep bending from the waist or long leaning forward - load away from the body or above shoulder height - sitting or standing	4

	<ul style="list-style-type: none"> - leaning far forward while twisting the trunk - load away from the body - restricted stability of posture during standing, squatting or kneeling 	8
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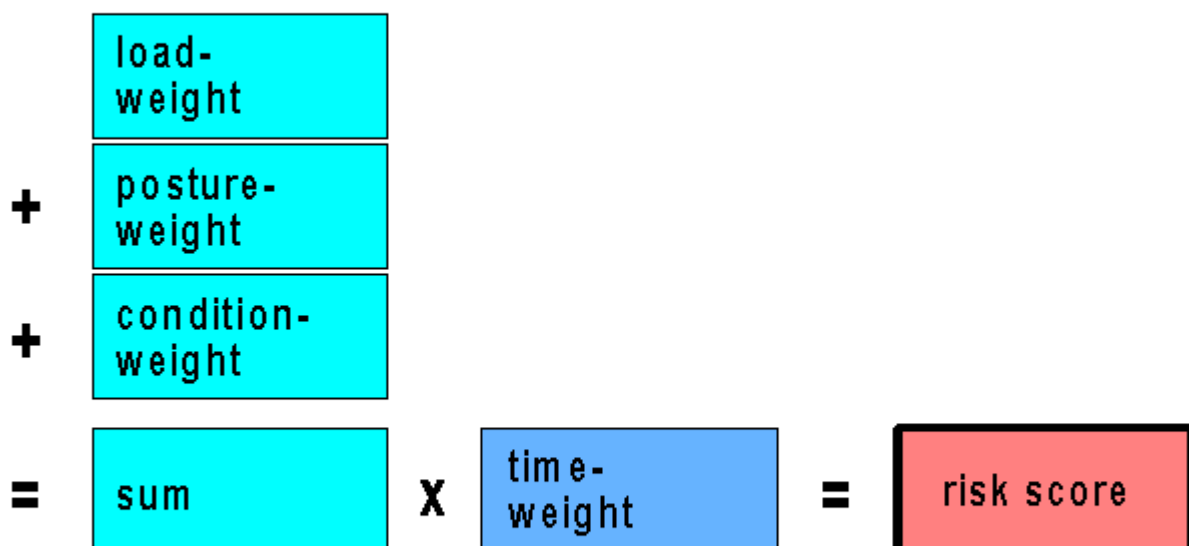
The third step is the estimation of the posture weight according to the four figures and the related descriptions.

4th step: Estimation of the working weight

execution conditions	condition weight
good ergonomic conditions, e. g. enough working space, even solid floor, adequate illumination, good gripping conditions	0
- restricted work place (height too low, area < 1,5 m ²)	1
- restricted postural stability (floor uneven, soft, slippery, sloping)	1

The fourth step is the decision on the working conditions weight - Are they good or not good?

5th step: evaluation



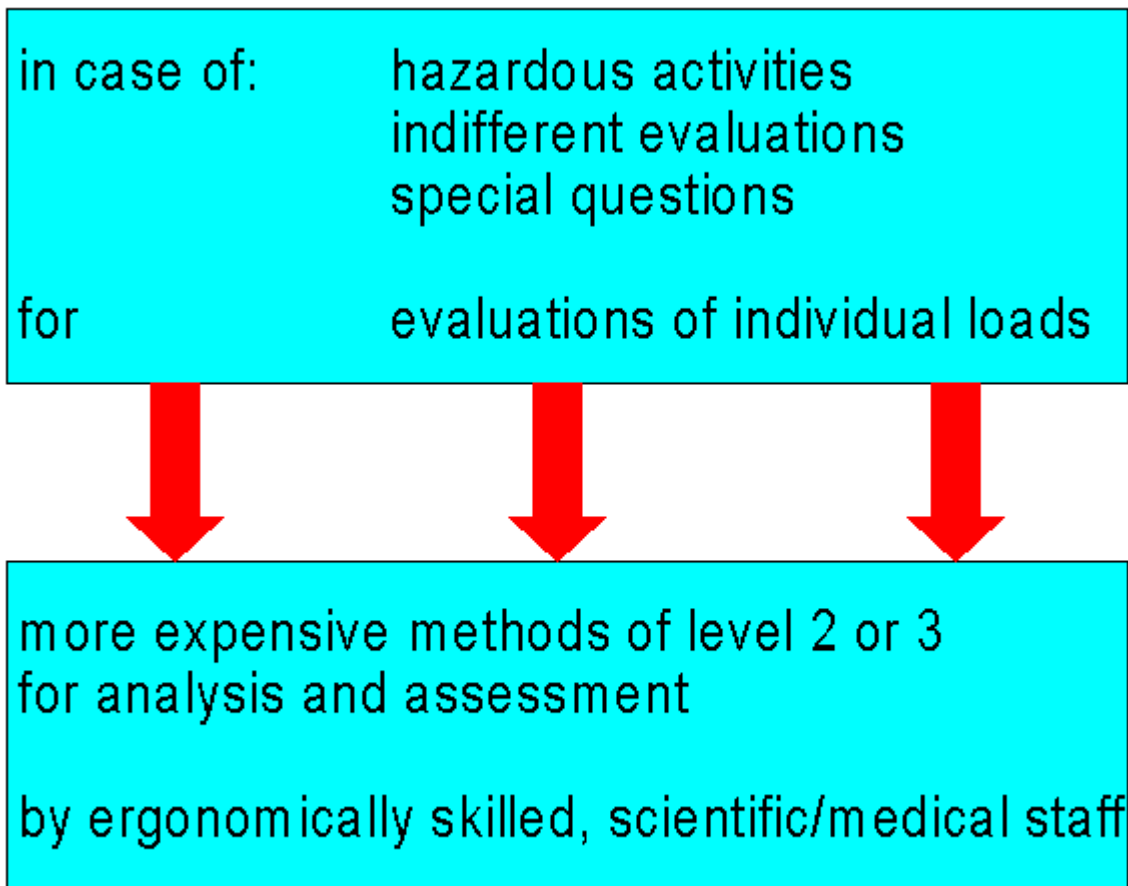
The fifth step is the evaluation by calculating such a simple equation. The result of this calculation is the so called risk score.

6th step: Assessment

risk zone	risk score	description
1	< 10	low load situation, health hazard due to the physical overstrain is unlikely to appear
2	10 < 25	increased load situation, an overload situation is possible for less resilient persons for this group ²⁾ workplace redesign is helpfull
3	25 < 50	high increased load situation, physically overload is possible, even for "normal" persons, workplace redesign is recommended ³⁾
4	50	high load situation, physically overload is likely to appear, workplace redesign is essential ³⁾

In the final sixth step the risk score has to be compared with the values in the evaluation table. The result of the risk assessment is the ranking in one of the four risk zones and the risk score itself. According to the value of the risk score the employer is able to derive a plan of measures with priorities. At workplaces in risk zone 4 an ergonomic redesign is essential, in risk zone 3 recommended. But there is no sharp border between the risk zones!

Which ergonomic redesign at the workplaces is required? The employer can see it from the weights of the key items in the risk score. So it is obvious where the reasons for the high risk are. Therefore this screening method is useful in the identification of ergonomic lacks, very easy to use and very helpful for the employers as well as for the labour inspectors.



But you should know that the method is not suitable for the evaluation of individual stress in cases of occupational diseases or for the evaluation of activities like pushing or pulling. In cases of hazardous activities, indifferent evaluations or special questions more expensive methods for the risk assessment are necessary. These have to be applied by ergonomically skilled and scientific or medical staff.

This screening method was successfully tested at 400 workplaces. The user comments of the 47 labour inspectors to the key item method were predominantly positive as well as the comments of 200 testers from enterprises. As the method is so simple and accepted by the test persons, the authors of the method have to warn of an application without any criticism. The risk scores are not absolutely correct, over- or underloads are possible, especially at the borders of the weighting zones. Interpolations can minimize these errors.

The presented guideline on handling of loads is an excellent method for the labour inspectors to advice employers of small and medium sized enterprises or for the employers to inform themselves to inform about the risks of handling of loads and to fulfil the obligations of the decree on handling of loads.

At present a new draft of an European Council directive on the protection of the health and safety of workers from the risks related to physical agents at work is under discussion between some experts of the European memberstates now. I am involved in this discussion and will be one of the authors of the first two annexes on hand-arm and whole-body vibration. There will defined occupational exposure limit values and so called action values, above that technical and organizational measures are to be implemented in the workplace. Experts will develop similar guidelines for the evaluation and for the risk assessment of these physical agents like the presented one of manual handling of loads.

Dr. Detlev Mohr
Landesinstitut für Arbeitsschutz und Arbeitsmedizin
Postfach 90 02 36
D-14438 Potsdam
Germany

www.brandenburg.de/liaa

e-mail: detlev.mohr@liaa.brandenburg.de