

Chapter 2.5: Effects of work on health: Physical demands and Ergonomics

Dr P Paul FM Kuijer, p.p.kuijer@amc.nl, <http://www.amc.nl/web/Research/Who-is-Who-in-Research/Who-is-Who-in-Research.htm?p=1398>, consultant on work-related musculoskeletal disorders, Coronel Institute of Occupational Health, Academic Medical Center / University of Amsterdam, the Netherlands, last updated 28/11/2011

Feedback on the self-assessment exercises

Question 1: statement a is the right answer.

Let's start with the incorrect answers. We learned in this chapter that walking and running are not qualified as risk factors for low back pain (see paragraph 2.1 assessment of the work-relatedness of non-specific low-back pain). So answer c is incorrect. That leaves a, and b.

From the same paragraph, the picture presented and the data given in the assignment above, we know that of the three evidence based risk factors for low back pain, 'manual materials handling', 'bending or twisting of trunk' and 'whole body vibration' a Dutch waste collector is mostly exposed to the first two risk factors. A waste collector hardly sits in the truck. Moreover, the first two risk factors can result in a maximum of 7 points and the last risk factor 'only' in 5 points. Therefore, answer b is incorrect. Therefore, answer a is the right one.

Question 2: statement a is the correct 'incorrect' answer

The 12 columns represent the peak compression force of each waste collector while lifting a bag. As can be seen, the peak compression force for all waste collectors exceeds 3400 N. Therefore, the average compression can NOT be on average 2600 Newton. Moreover a compression force of 3400 N or more is seen as a risk factor for low back complaints (see paragraph 1.4, Back to Jack)

Question 3: statement a is the correct answer

Paul works as a truck driver and does not perform lifting of bags. Therefore, he is only at risk for non-specific low back pain due to whole body vibration. Clicking on the provided link '<http://www.ispesl.it/vibrationdatabase/documenti/leggiDett.asp?lang=en&quale=134>' (November 2011) shows the following website:

ISPESL - Vibrations Database - Vehicle Details

[Print](#)

Manufacturer/Model	MERCEDES	1831
Vehicles Type	Gerbage truck	
Power Supply	power supply	
Data provided by:	AUSL 7 Siena - Laboratorio Agenti Fisici	08/06/04

Technical specifications

Manufacturer	MERCEDES
Model	1831
Vehicles Type	Gerbage truck
Power [KW]	
Weight [Kg]	
Technical notes	12000 cc
Reference Standard	ISO 2631-1 1997
Declared noise level	
Declared vibration level [m/sec ²]	



Field measurement (analytical method)

Date of measurement	08/06/04	Measurement position	Seat
Reference	AUSL 7 Siena - Laboratorio Agenti Fisici	Weighted values ISO 2631/1997 (0=n.d.)	
Place of measurement	Castelnuovo B.ga	a w x	0,12 m/sec ²
Sector of measurement	Smaltimento rifiuti	a w y	0,1 m/sec ²
Masurement methods	ISO 2631	a w z	0,23 m/sec ²
Accessories used	raccoglitore automatico cassonetti	a w max	0,23 m/sec ²
Ground type	asfalto	A(8) (m/sec²)	
Road type	Asfaltata provinciale	0,08	0,12
Driving speed	medio	0,14	0,16
Suspension type		0,18	0,22
Seat type	di serie (ammortizzato)	0,2	0,23
Seat adjustment		1	2
Seat armrests	Presenti	3	4
Work	Spostamenti per lo svuotamento cassonetti	5	6
		7	8
		Exposure time (hours)	

This is the waste (garbage) truck Paul drives during 6 hours a day. Vibration measurements that have been performed with this truck in action show that the vibration exposure level for 6 hours driving is 0.2 m/s² (see the red circle). Looking at both exposure criteria in 'Step 2. Assess exposure to work-related risk factors, paragraph 2.1' show that both criteria are not exceeded. Therefore, Paul receives 0 points for whole body vibration, and of course 0 points for manual materials handling and 0 points for bending and twisting of the trunk. A total of 0 points is a work-related attributable fraction of 0% according to step 3 Probability of work-relatedness in paragraph 2.1, regardless of Paul's age. So the correct answer is a.

Question 4: statement b is the correct answer

The work-related risk factors for non-specific low back pain in waste collection of bags are manual materials handling as in lifting and carrying and bending or twisting of the trunk (see paragraph 2.1 assessment of the work-relatedness of non-specific low-back pain)). Ergonomic measures that reduce the exposure due to these risk factors might be effective.

A preventive advice often given is to improve a proper manual material handling technique. Unfortunately, there is a vast amount of evidence that shows that this is not an effective measure (see also paragraph 2.3.2 Prevention and <http://summaries.cochrane.org/CD005958/advice-on-material-handling-techniques-and-using-assistive-devices-to-prevent-and-treat-back-pain-in-workers>). One of the explanations is that regardless of the used 'lifting technique' the biomechanical

load on the low back remains about the same. So lifting a heavy object in an unfavourable posture remains a risk. Therefore, answer a is incorrect.

By introducing two-wheeled containers lifting and carrying is replaced by pushing and pulling. Pushing and pulling is not a risk factor for low back complaints. Therefore, answer b might be right.

Finally, in contrast to many beliefs body weight is not a personal risk factor for low back complaints (see also page 17 of the criteria document:

<http://www.occupationaldiseases.nl/datafiles/LowerBackPain.pdf>).

An explanation is that anatomical structures are strengthened due to the body weight increase. The only personal risk factor of influence on non-specific low back is age. The older a person gets the more often low back pain is experienced. This is also the explanation why with the same level of work-related exposure the attributable fraction diminishes with an increasing age. For instance, an exposure level of 14 points results for an employee younger than 35 years in a attributable fraction of 59%, in the age category of 35-45 years in 53%, and with an age of more than 45 years in 50% (see paragraph 2.1, step 3).

More information on other work-related health risks and preventive measures among waste collectors are described by Kuijer et al. (2004, 2010).