

# EASOM

European Association  
of Schools of Occupational Medicine



## **Assessment methods of ergonomic risks**

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# Ergonomics

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- Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.
- (International Ergonomics Association, 2000)

ISO 26800:2011 - Ergonomics -- General  
approach, principles and concepts



# Questions

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- Problem
- Knowledge
- Purpose
- Implementation



# Parts of body at risk

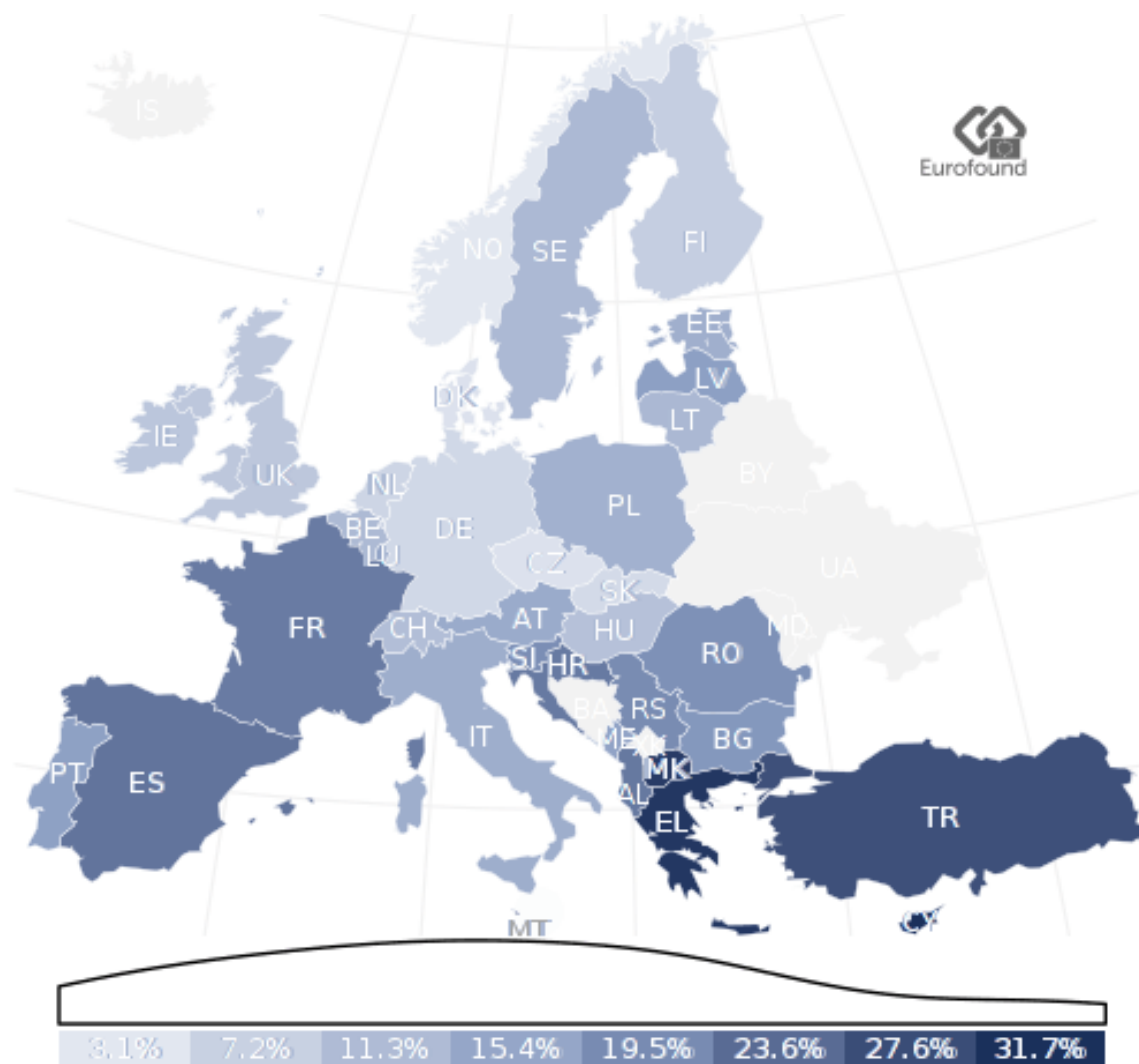
- **Low back**
- **Neck**
- **Shoulder**
- **Elbow**
- **Hand**
- **Knee**
- **Ankle**



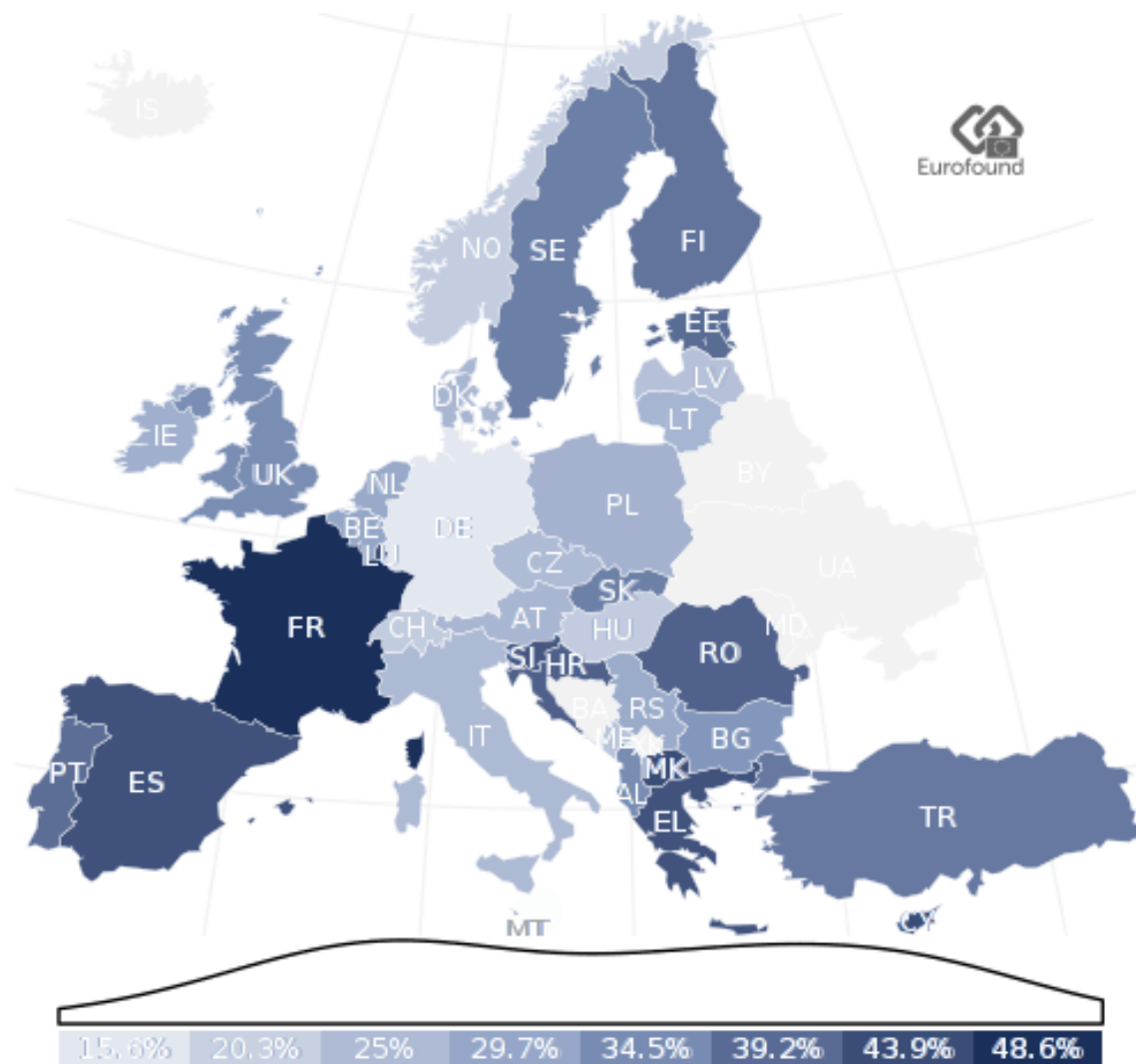
- **Shoulder**
- **Upper arm**
- **Forearm**
- **Wrist**
- **Hand**



# Does your work involve tiring or painful positions?

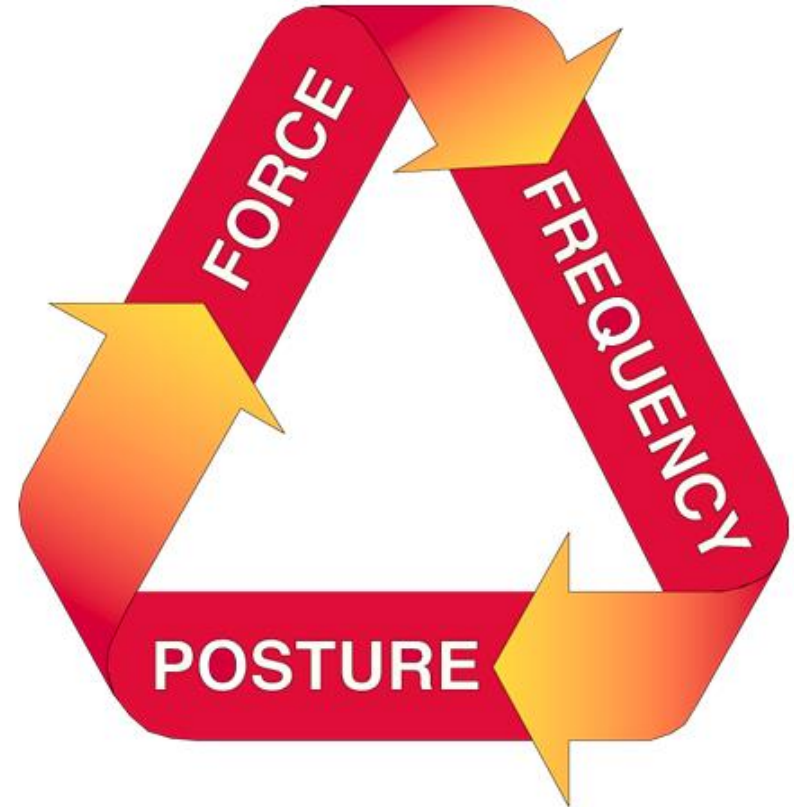


# Does your work involve repetitive hand or arm movements?

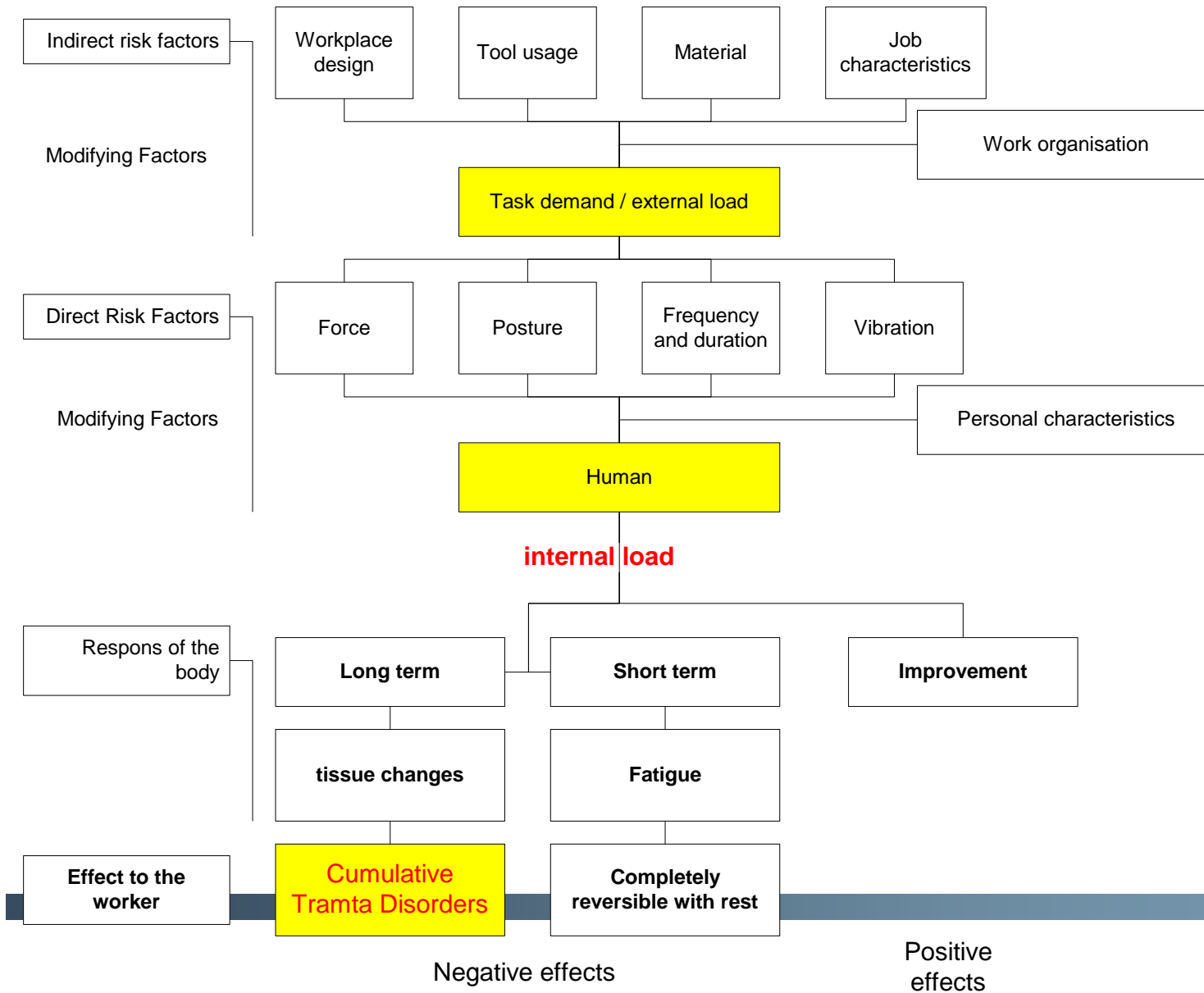


# Physical risk factors

- **Repetition**
- **Force**
- **Posture**
- **Vibration**
- **Combination of factors**
- **Cumulative damage**



# Factors to affect the risks of work-related musculoskeletal disorders





# Requirements

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- Easy usability for identification of ergonomic hazard, risks.
- The results have to be quantified or showed in green, yellow, or red.
- The terms of use has to be clear.
- Has to be legislation based, not only international experienced based.
- Has to cover a wide risk of WMSD.
- Fit the competency of user (not require special trainings).
- Fit the way of use (not require special tools).



# The application

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- As a part of health and safety risk assessment,
- During installation,
- During ergonomic review,
- Screening of ergonomic situations (example: accidents),
- In occupational and health studies



# Checklists



# Subjective discomfort Survey

KELEMETLENSÉG ÉRTÉKELŐ LAP



Helyszín		
Datum, idő		Vizsgálótervező

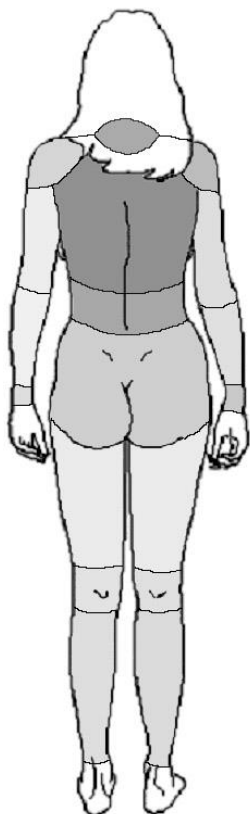
A táblázatban az érintett testrészekkel kapcsolatos kérdésekre válaszoljon a megfelelő négyzet bejelölésével!

		Az elmúlt héten munkavégzés közben milyen gyakran tapasztalt fájdalom, kellemetlen érzést az alábbi testrészekben?					A fájdalom vagy kellemetlenség érzése mennyire volt erős?			Ha tapasztalt fájdalmat, akkor az mennyire zavarta munkavégzésében?		
		Soha	1-2 alkalom	3-4 alkalom	Naponta egyszer	Naponta többször	Kissé kellemetlen	Közepesen kellemetlen	Nagyon kellemetlen	Egyáltalán nem	Kissé zavar	Lényegesen zavar
Nyak		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vall	Jobb	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Bal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hat		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Felső kar	Jobb	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Bal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Derekt		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alkar	Jobb	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Bal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Csukló	Jobb	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Bal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Csípő, fenék		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comb	Jobb	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Bal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Térd	Jobb	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Bal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lábszár	Jobb	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Bal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

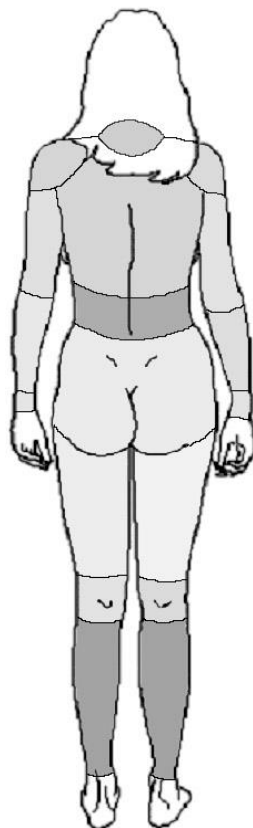
Megjegyzés:

# Subjective discomfort Survey - Results

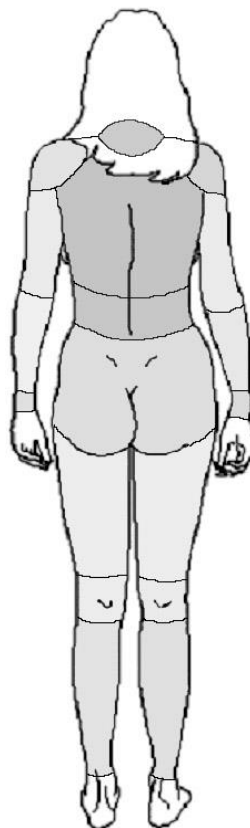
Sittig



Standing



Mixed



Naponta többszöri  
nagyon kellemetlen  
lényegesen zavaró  
fájdalom

Soha nem érez  
fájdalmat







# OWAS

OWAS

Task: 1

Description of the task:

% time in this task: %

Back (Task 1)

1. Straight  
2. Bent  
3. Twisted  
4. Bent and twisted

Arms (Task 1)

1. Both arms below shoulder level  
2. One arm at or above shoulder level  
3. Both arms at or above shoulder level

Legs (Task 1)

1. Sitting  
2. Standing on two straight legs  
3. Standing on one straight leg  
4. Standing or squatting on two bent legs  
5. Standing or squatting on one bent leg  
6. Kneeling  
7. Walking

Load (Task 1)

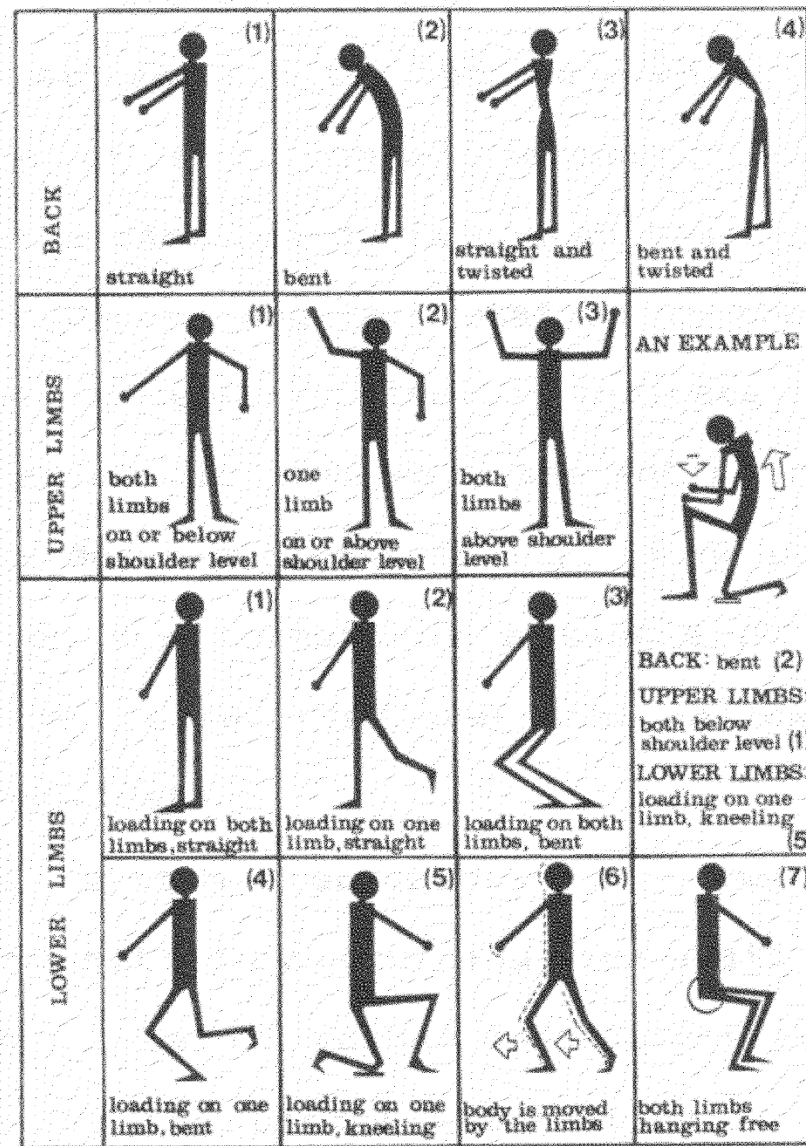
1. Less than 10 kg (22 lb)  
2. Between 10 - 20 kg (22 - 44 lb)  
3. Greater than 20 Kg (44 lb)

RESULT (Task 1)

SAVE

DATABASE

INFORMATION















## Ovako Working-postures Analysis System



Figure 1: OWAS protocol (prior art)

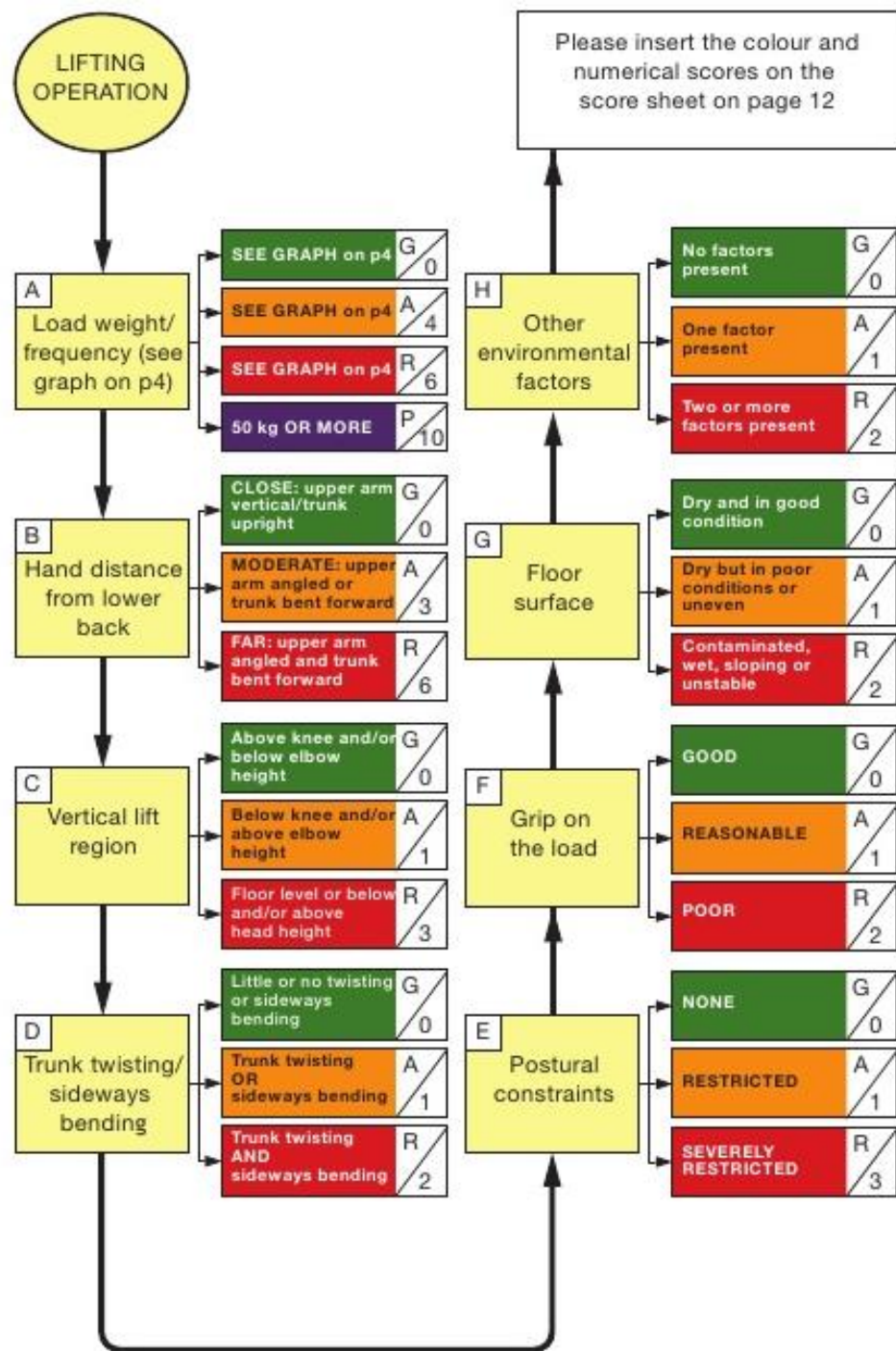
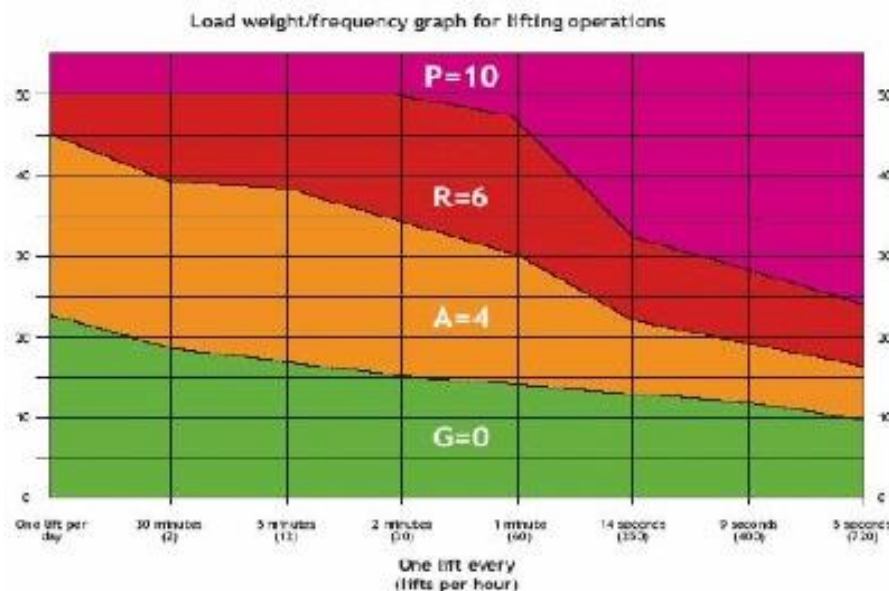
# BRIEF 1

Step 2		Hands and Wrists		Elbows		Shoulders	
<b>Identify Risks</b> ▼ <b>2a. Mark Posture and Force boxes when risk factors are observed.</b> ▼ <b>2b. For body parts with Posture or Force marked, mark Duration and/or Frequency box(es) when limits are exceeded.</b>		 Flexed $\geq 45^\circ$  Ulnar Deviation  Extended $\geq 45^\circ$  Radial Deviation		 Rotated Forearm  Fully Extended $\geq 135^\circ$		 Arm Raised $\geq 45^\circ$  Arm Behind Body  Shoulders Shrugged	
		Left	Right	Left	Right	Left	Right
2a.	Posture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Force	Pinch Grip or Finger Press $\geq 2$ lb (0.9 kg), or Power Grip $\geq 10$ lb (4.5 kg)  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>		$\geq 10$ lb (4.5 kg) <input type="checkbox"/>	$\geq 10$ lb (4.5 kg) <input type="checkbox"/>	$\geq 10$ lb (4.5 kg) <input type="checkbox"/>	$\geq 10$ lb (4.5 kg) <input type="checkbox"/>
2b.	Duration	$\geq 10$ sec. <input type="checkbox"/>	$\geq 10$ sec. <input type="checkbox"/>	$\geq 10$ sec. <input type="checkbox"/>	$\geq 10$ sec. <input type="checkbox"/>	$\geq 10$ sec. <input type="checkbox"/>	$\geq 10$ sec. <input type="checkbox"/>
	Frequency	$\geq 30/\text{min.}$ <input type="checkbox"/>	$\geq 30/\text{min.}$ <input type="checkbox"/>	$\geq 2/\text{min.}$ <input type="checkbox"/>	$\geq 2/\text{min.}$ <input type="checkbox"/>	$\geq 2/\text{min.}$ <input type="checkbox"/>	$\geq 2/\text{min.}$ <input type="checkbox"/>
	Score	0	0	0	0	0	0
	Risk Rating	H M <b>L</b>	H M <b>L</b>	H M <b>L</b>	H M <b>L</b>	H M <b>L</b>	H M <b>L</b>





# Manual handling Assessment Chart



# JSI – Job Strain Index

Rating	Intensity of Exertion (IE)	Duration of Exertion (DE)	Efforts/ Minute (EM)	Hand/Wrist Posture (HWP)	Speed of Work (SW)	Duration per Day (DD)
1	Light (1)	<10% (0.5)	<4 (0.5)	Very good (1)	Very slow (1)	<1 (.25)
2	Somewhat hard (3)	10-29% (1)	4-8 (1)	Good (1)	Slow (1)	1-2 (.5)
3	Hard (6)	30-49% (1.5)	9-14 (1.5)	Fair (1.5)	Fair (1)	2-4 (.75)
4	Very hard (9)	50-79% (2)	15-19 (2)	Bad (2)	Fast (1.5)	4-8 (1)
5	Near maximal (13)	80-100% (3)	>=20 (3)	Very bad (3)	Very fast (2)	>=8 (1.5)

$$\text{JSI} = \text{IE} \times \text{DE} \times \text{EM} \times \text{HWP} \times \text{SW} \times \text{DD}$$

Moore, J.S. and Garg, A. (1995) American Industrial Hygiene Journal 56:443-58.



A. Neck, Trunk and Leg Analysis

Step 1: Locate Neck Position



Step 1a: Adjust...  
If neck is twisted: +1  
If neck is side bending: -1

Neck Score

Step 2: Locate Trunk Position



Step 2a: Adjust...  
If trunk is twisted: +1  
If trunk is side bending: +3

Trunk Score

Step 3: Legs



Adjust:  
30-60° Add +1  
60° Add +2

Leg Score

Step 4: Look-up Posture Score in Table A

Using values from steps 1-3 above, locate score in Table A.

Posture Score A

Step 5: Add Force/Load Score

If load < 11 lbs: +0  
If load 11 to 22 lbs: +1  
If load > 22 lbs: +2  
Adjust: If shock or rapid build up of force: add +1

Force/Load Score

Step 6: Score A, Find Row in Table C

Add values from steps 4 & 5 to obtain Score A. Find Row in Table C.

Score A

Scoring:

1 = negligible risk  
2 or 3 = low risk, change may be needed  
4 to 7 = medium risk, further investigation, change soon  
8 to 10 = high risk, investigate and implement change  
11+ = very high risk, implement change

SCORES

Table A	Neck												
		1				2				3			
	Legs	1	2	3	4	1	2	3	4	1	2	3	4
Trunk Posture Score	1	1	2	3	4	1	2	3	4	3	3	5	6
	2	2	3	4	5	3	4	5	6	4	5	6	7
	3	2	4	5	6	4	5	6	7	5	6	7	8
	4	3	5	6	7	5	6	7	8	6	7	8	9
	5	4	6	7	8	6	7	8	9	7	8	9	9

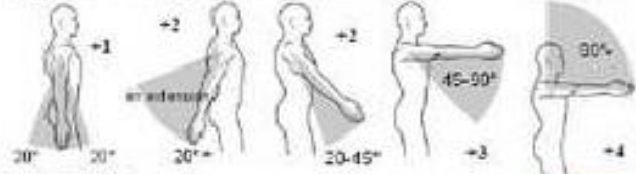
Table B	Lower Arm							
		1			2			
	Wrist							
		1	2	3	1	2	3	
Upper Arm Score	1	1	1	2	2	1	2	3
	2	1	1	2	3	2	3	4
	3	3	3	4	5	4	5	5
	4	4	4	5	5	5	6	7
	5	5	5	7	8	7	8	8
	6	7	7	8	8	8	9	9

Score A (score from table A + load/force score)	Table C											
	Score B, (table B value + coupling score)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	1	2	3	3	4	5	6	7	7	7
2	1	2	2	3	4	4	5	6	6	7	7	8
3	2	3	3	3	4	5	6	7	7	8	8	8
4	3	4	4	4	5	6	7	8	8	9	9	9
5	4	4	4	5	6	7	8	8	9	9	9	9
6	6	6	6	7	8	8	9	9	10	10	10	10
7	7	7	7	8	9	9	9	10	10	11	11	11
8	8	8	8	9	10	10	10	10	10	11	11	11
9	9	9	9	10	10	10	11	11	11	12	12	12
10	10	10	10	11	11	11	11	12	12	12	12	12
11	11	11	11	11	12	12	12	12	12	12	12	12
12	12	12	12	12	12	12	12	12	12	12	12	12

Table C Score + Activity Score = Final REBA Score

B. Arm and Wrist Analysis

Step 7: Locate Upper Arm Position:



Step 7a: Adjust...  
If shoulder is raised: +1  
If upper arm is abducted: +1  
If arm is supported or person is leaning: -1

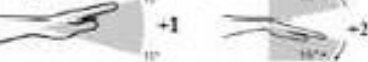
Upper Arm Score

Step 8: Locate Lower Arm Position:



Lower Arm Score

Step 9: Locate Wrist Position:



Step 9a: Adjust...  
If wrist is bent from midline or twisted: Add +1

Wrist Score

Step 10: Look-up Posture Score in Table B

Using values from steps 7-9 above, locate score in Table B

Posture Score: B

Step 11: Add Coupling Score

Well fitting handle and mid range power grip, good: +0  
Acceptable but not ideal hand hold or coupling acceptable with another body part, fair: +1  
Hand hold not acceptable but possible, poor: +2  
No handles, awkward, unsafe with any body part, unacceptable: +3

Coupling Score

Step 12: Score B, Find Column in Table C

Add values from steps 10 & 11 to obtain Score B. Find column in Table C and match with Score A in row from step 6 to obtain Table C Score.

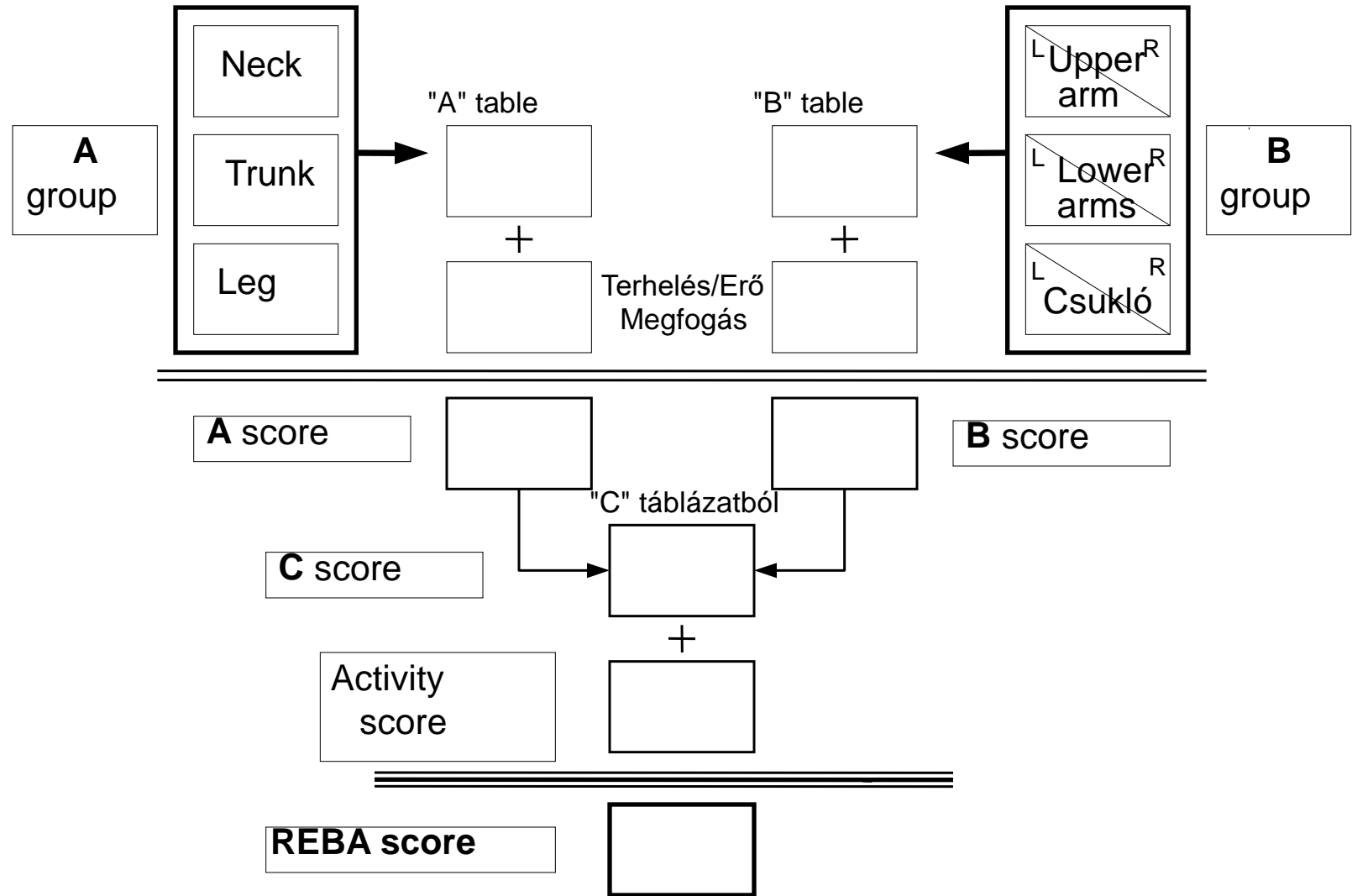
Score B

Step 13: Activity Score

+1 1 or more body parts are held for longer than 1 minute (static)  
+1 Repeated small range actions (more than 4x per minute)  
+1 Action causes rapid large range changes in postures or unstable base



# REBA – Rapid Entire Body Assessment



# OCRA (Occupational Repetitive Actions )

**Cumulative Trauma Disorders Risk Assessment Model**

File Edit Help

**Task Information**

Add Edit Delete

Cutting of large shells  
Cutting of small shells

**Force Freq. Factors**

Analyst: Ergonomist Job Name: Seashells Buttons Workstation ID: 123

**Hand**  
☐ Right Side  
☒ Left Side

**Job Duration**  
Hours Worked per Shift: 8 Job Cycle Time (min): 0.5 No. Of Cycles: 5 Hand Span: 5 cm

**Strength Data:**  
MVC % Required: 5

**Task Duration (per Cycle Time)**  
Work Time (min): 0.2 Rest Time (min): 0.3

**Repetition**  
No. Of Rep.: 1

**Grip Type**

Power Grip Lateral Pinch

Chuck Pinch 2-Point Pinch

**Radial/Ulnar Deviation Angle:**

Neutral

**Flexion/Extension Angle:**

Neutral

**Wrist Position**  
Pronation Mid-Position (Neutral) Supination



# And the others on-line

**[Dis]comfort Survey**

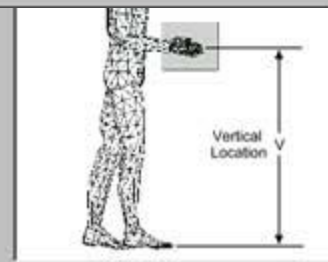
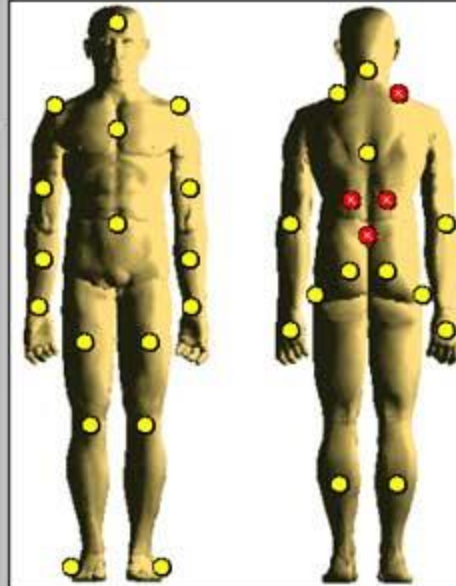
Comfort ID:

Activity:

Show All Information

Body Part	Discomfort Level	Body Part	Discomfort Level
Head		Neck	
Left Shoulder		Right Shoulder	
Left Trapezius		Right Trapezius	
Chest	10	Thoracic	
Left Upper Arm	9	Right Upper Arm	
Left Elbow	8	Right Elbow	
Left Forearm	7	Right Forearm	
Left Wrist	6	Right Wrist	
Left Hand	5	Right Hand	
Abdomen	4	Lumbar	8
Left Erector Sp.	5	Right Erector Sp.	9
Left Gluteus	2	Right Gluteus	
Left Hip	1	Right Hip	
Left Thigh	0	Right Thigh	
Left Knee		Right Knee	
Left Lower Leg		Right Lower Leg	
Left Foot		Right Foot	

Rating of Perceived Exertion:



Origin: Vertical Location in cm

Destination: Vertical Location in cm

**RULA Wizard**

**RULA (Rapid Upper Limb Assessment) Wizard**

Step 10/11: Locate Trunk Position:

☒ Erect or Seated in Extension (supported)    ☐ Flexed 0° to 20°  
☐ In Extension (unsupported)    ☐ Flexed 20° to 60°  
☐ Flexed 60° or more

Step 10: Indicate the trunk position on the image to the left. Additionally, if any of the following conditions exist, check the appropriate box:

☐ Trunk is twisted  
☐ Trunk is side-bending

Trunk Score:


Step 11: Indicate the leg score below:

☒ Legs and feet supported and balanced  
☐ Legs and feet not supported and balanced

Leg Score:



<http://www.nexgenergo.com/ergonomics/ergomast.html>



## Composite Ergonomic Risk Assessment

☐ The load lifted by the worker exceeded 25 kg, or 50 kg by One adult is moved by a person without lifting aids. (Def)

☐ The lifting or lowering happens regularly over the height

**Pre-conditions:**

☐ Horizontal weight displacement may not exceed 2 meters.

☐ Manual handling is performed while standing, the employee is not hindered by external.

☐ Lifting is performed by only one person, using only

☐ singular posture.

☐ There are no rapid movements, jerks, or jams.

☐ The object moved can be grasped properly.

☐ The object to be lifted can be held against the body, meaning

☐ that it is not too cold or too hot and not polluted.

➡ If any condition is NOT met, other

➡ If all condition is met you can continue

↓

**1. Critical load**


☐ The weight does not exceed 10,5 kg.

☐ The vertical displacement is maximum 25 cm, by

☐ The lifting frequency is maximum 1 per 5 minutes

☐

Push without support				Pull with support			
							
G	Y	R		G	Y	R	
<10			20c	<45			65 c
Fetal work from lower leg				Push (whole body)			
							
G	Y	R		G	Y	R	P
<95			135c	<40			55 c
<p>Notes:</p>							



# Composite Ergonomic Risk Assessment


Page 1 of 1

---


DATA	DATE:
Name of the Workplace	
Name of the Job	
Short Description of Work Activity	
Designation of the Worker	
Gender	Age:
Net Working Time [min]	
Gross Working Time [min]	
Number of (systematic)	

X Evaluation Pages	Results
<input type="checkbox"/> Posture	<div style="display: flex; justify-content: space-around;"> <span style="background-color: #90EE90; padding: 2px;">G</span> <span style="background-color: #FFB6C1; padding: 2px;">R</span> </div>
<input type="checkbox"/> Force Exertion	<div style="display: flex; justify-content: space-around;"> <span style="background-color: #90EE90; padding: 2px;">G</span> <span style="background-color: #FFFF00; padding: 2px;">Y</span> <span style="background-color: #FFB6C1; padding: 2px;">R</span> </div>
<input type="checkbox"/> Manual Handling	<div style="display: flex; justify-content: space-around;"> <span style="background-color: #90EE90; padding: 2px;">G</span> <span style="background-color: #FFFF00; padding: 2px;">Y</span> <span style="background-color: #FFB6C1; padding: 2px;">R</span> </div>
<input type="checkbox"/> Repetitive Movements	<div style="display: flex; justify-content: space-around;"> <span style="background-color: #90EE90; padding: 2px;">G</span> <span style="background-color: #FFFF00; padding: 2px;">Y</span> <span style="background-color: #FFB6C1; padding: 2px;">R</span> </div>
<input type="checkbox"/> VDT Workplace	<div style="display: flex; justify-content: space-around;"> <span style="background-color: #90EE90; padding: 2px;">G</span> <span style="background-color: #FFFF00; padding: 2px;">Y</span> <span style="background-color: #FFB6C1; padding: 2px;">R</span> </div>


Typical positions at work: occurrence or percentage



%



%



%

Legend of colour coding at evaluation

Acceptable
  Further study is needed
  High risk

Musculoskeletal Discomfort Questionnaire (single-part)  
Using the Standing Human Figure

of Repetitive Movements necessary if there are movements frequently.

evaluator: \_\_\_\_\_

orkplace: \_\_\_\_\_

ind Ideas:

Worker about the Work

Right Hand

## wMSDs still persists

# The Composite Ergonomic Risk Assessment

- A paper-pencil method which is easy to use for anyone after some practice, and which gives a simple evaluation after a separate determination of the different ergonomic risks.
- A workbook which allows detailed assessments and provide risk levels in borderline cases, according to the standard methods given a detailed evaluation, which method occupational safety and health professionals can use after a few days training.
- An imaging-based method, which is based on observations of real activity.





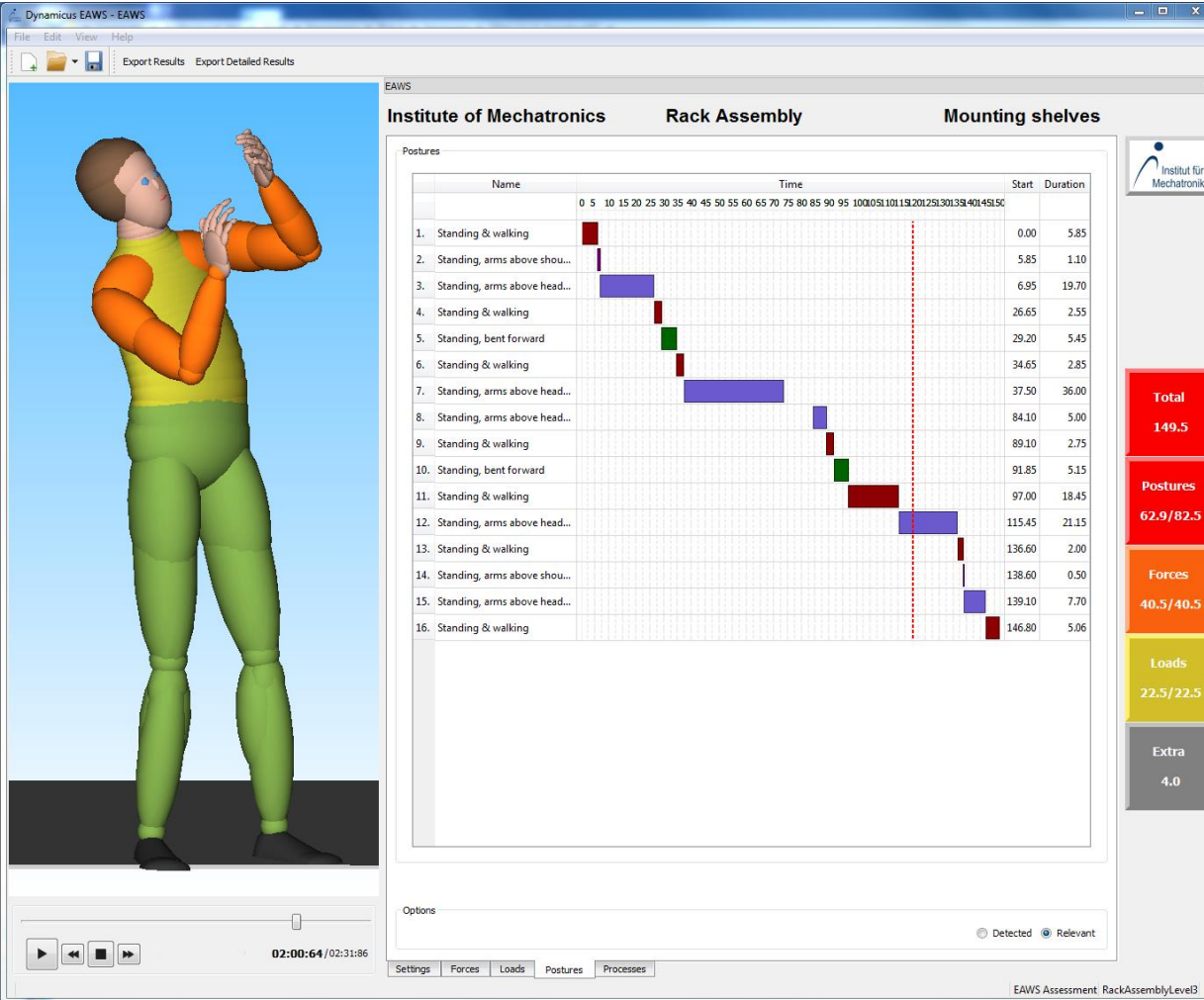
# The Composite Ergonomic Risk Assessment

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- The method according to EN 1005 series of standards for appropriate assessment of the elements, namely:
  - posture,
  - manual handling,
  - effort,
  - repetitive movements,
- Plus
  - Subjective discomfort,
  - Workplace history,
  - Improvement ideas



# Ergonomic Assessment Worksheet



Ergonomic Assessment Worksheet V1.3.3

Basic Positions / Postures and movements of trunk and arms (per shift)											Postures																																																																																																																							
Evaluation of static postures and/or high frequent movements of trunk/arms											Asymmetry effects																																																																																																																							
Duration [sec/min] = duration of posture(s) x 60 cycle time											Trunk Rotation 1) Lateral Bending 1) Far Reach 2)																																																																																																																							
Static postures: > 4sec											Sum of lines																																																																																																																							
High frequent movements: 2 trunk bendings or 10 arm liftings > 60° per min											int : dur 0-5 : 0-3 Intensity x Duration																																																																																																																							
[%] [sec/min] [min/8h]											int : dur 0-5 : 0-3 Intensity x Duration																																																																																																																							
5 7.5 10 15 20 27 33 50 67 83 3 4.5 6 9 12 16 20 30 40 50 24 36 48 72 96 130 160 240 320 400											int : dur 0-5 : 0-3 Intensity x Duration																																																																																																																							
<b>Standing (and walking)</b>																																																																																																																																		
1		Standing & walking in alternation, standing with support	0	0	0	0	0.5	1	1	1.5	2	0.9	1.8	0.8	0.0	0.0	0.3	2.2																																																																																																																
2		Standing, no body support (for other restrict. see Extra Points)	0.7	1	1.5	2	3	4	6	8	11	13	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
3		Bent forward (20-60°) with suitable support	2	3	5	7	9.5	12	18	23	32	40	2.8	1.5	2.5	0.0	0.0	0.0																																																																																																																
4		Strongly bent forward (>60°) with suitable support	3.3	5	8.5	12	17	21	30	38	51	63	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
5		Upright with elbow at / above shoulder level	3.3	5	8.5	12	17	21	30	38	51	63	0.8	0.0	0.0	0.0	0.2	2.0																																																																																																																
6		Upright with hands above head level	5.3	8	14	19	26	33	47	60	80	100	70.5	3.0	0.4	0.0	0.0	0.4																																																																																																																
<b>Sitting</b>																																																																																																																																		
7		Upright with back support slightly bent forward or backward	0	0	0	0	0	0	0.5	1	1.5	2	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
8		Upright no back support (for other restrict. see Extra Points)	0	0	0.5	1	1.5	2	3	4	5.5	7	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
9		Bent forward	0.7	1	1.5	2	3	4	6	8	11	13	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
10		Elbow at / above shoulder level	2.7	4	7	10	13	16	23	30	40	50	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
11		Hands above head level	4	6	10	14	20	25	35	45	60	75	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
<b>Kneeling or crouching</b>																																																																																																																																		
12		Upright	3.3	5	7	9	12	15	21	27	36	45	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
13		Bent forward	4	6	10	14	20	25	35	45	60	75	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
14		Elbow at / above shoulder level	6	9	16	23	33	43	62	80	108	135	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
<b>Lying or climbing</b>																																																																																																																																		
15		(Lying on back, breast or side) arms above head	6	9	15	21	29	37	53	68	91	113	0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
16		Climbing	6.7	10	22	33	50	66					0.0	0.0	0.0	0.0	0.0	0.0																																																																																																																
<table><tr><td colspan="4">1) Trunk</td><td colspan="4">2) Far Reach</td><td colspan="2">Σ</td></tr><tr><td>int</td><td>0</td><td>1</td><td>3</td><td>5</td><td>int</td><td>0</td><td>1</td><td>3</td><td>5</td><td></td></tr><tr><td>slightly &lt;10°</td><td>medium 15°</td><td>strongly 25°</td><td>extreme &gt;30°</td><td></td><td>close</td><td>60°</td><td>80°</td><td>arm stretched</td><td></td><td></td></tr><tr><td>never</td><td>4s</td><td>10s</td><td>13s</td><td></td><td>never</td><td>4s</td><td>10s</td><td>13s</td><td></td><td></td></tr><tr><td>0%</td><td>6%</td><td>15%</td><td>20%</td><td></td><td>0%</td><td>6%</td><td>15%</td><td>20%</td><td></td><td></td></tr><tr><td colspan="4"></td><td colspan="4"></td><td colspan="2">75.0</td><td colspan="2"></td></tr><tr><td colspan="4"></td><td colspan="4"></td><td colspan="2">6.4</td><td colspan="2">1.1</td></tr><tr><td colspan="4"></td><td colspan="4"></td><td colspan="2">(max=15)</td><td colspan="2">(max=10)</td></tr><tr><td colspan="4"></td><td colspan="4"></td><td colspan="2">7.5</td><td colspan="2"></td></tr><tr><td colspan="4"></td><td colspan="4"></td><td colspan="2">(a)</td><td colspan="2">(b)</td></tr></table>																	1) Trunk				2) Far Reach				Σ		int	0	1	3	5	int	0	1	3	5		slightly <10°	medium 15°	strongly 25°	extreme >30°		close	60°	80°	arm stretched			never	4s	10s	13s		never	4s	10s	13s			0%	6%	15%	20%		0%	6%	15%	20%											75.0												6.4		1.1										(max=15)		(max=10)										7.5												(a)		(b)	
1) Trunk				2) Far Reach				Σ																																																																																																																										
int	0	1	3	5	int	0	1	3	5																																																																																																																									
slightly <10°	medium 15°	strongly 25°	extreme >30°		close	60°	80°	arm stretched																																																																																																																										
never	4s	10s	13s		never	4s	10s	13s																																																																																																																										
0%	6%	15%	20%		0%	6%	15%	20%																																																																																																																										
								75.0																																																																																																																										
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								7.5																																																																																																																										
								(a)		(b)																																																																																																																								
Attention: Max. duration of evaluation = duration of task or 100%!																																																																																																																																		
Attention: correct evaluation, if duration of evaluation ≠ 60s																																																																																																																																		
<b>Postures = Σ lines 1 - 16</b>																																																																																																																																		
75.0 (a) + 7.5 (b) = 82.5																																																																																																																																		



# Apps

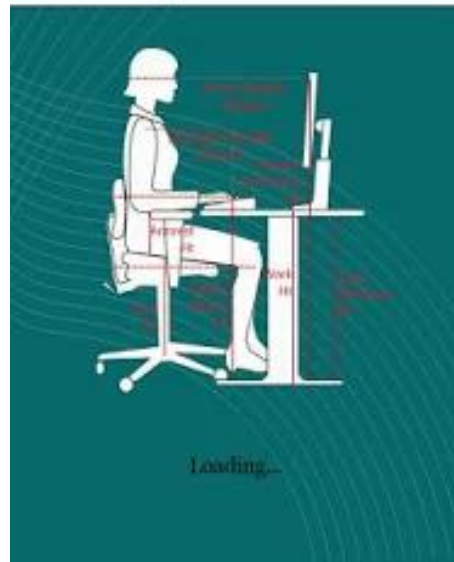


## HSE RULA

Rapid  
Upper  
Limb  
Assessment



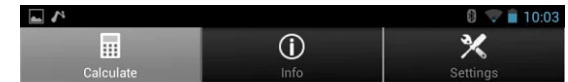
### Office Ergonomics Evaluation



Pfeil einfügen

Linienfarbe

Textfarbe



**INTERGO**  
human factors · ergonomics

#### Horizontal Location (H)

Horizontal Location is measured from the mid-point of the line joining the inner ankle bones to a point projected on the floor directly below the mid-point of the hand grasps (i.e. load center), as defined by the large middle knuckle of the hand.

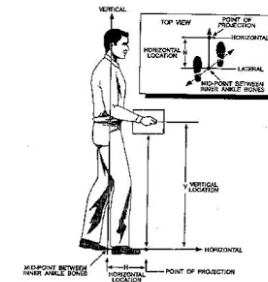
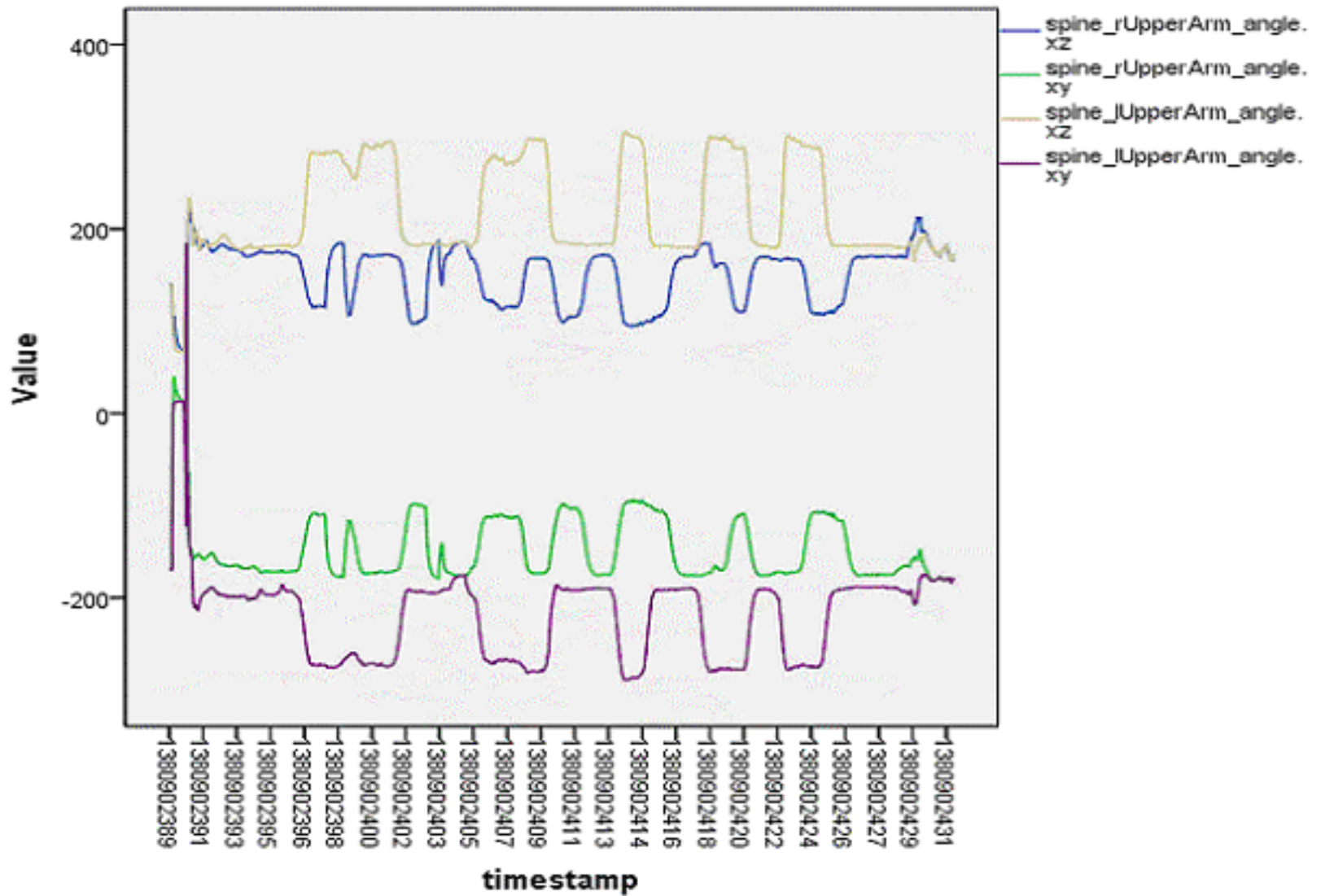


Figure 1 Graphic Representation of Hand Location

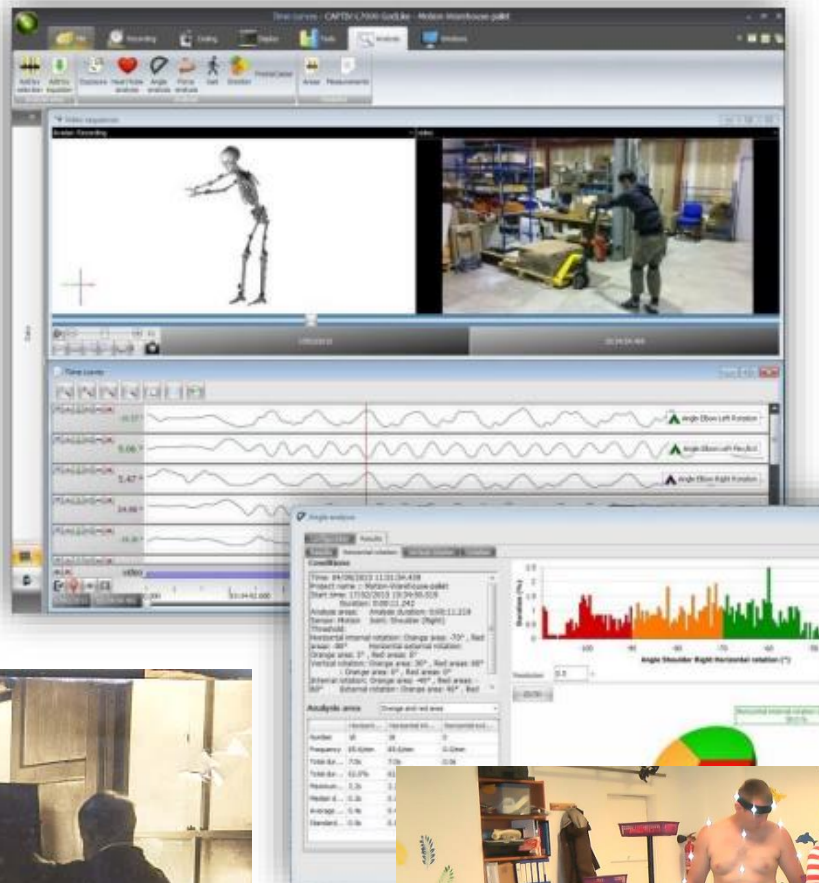


# Graphs of some calculated joint degrees

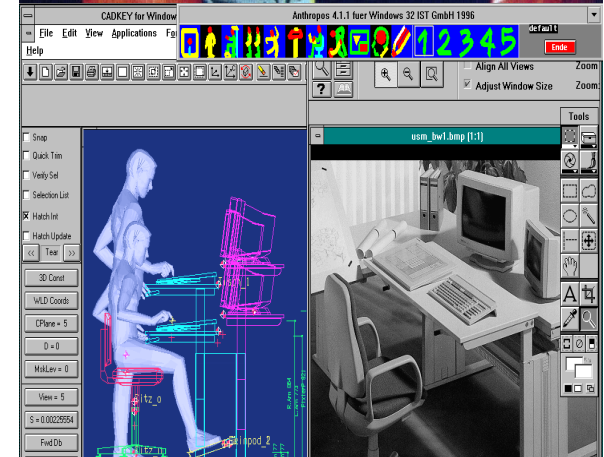
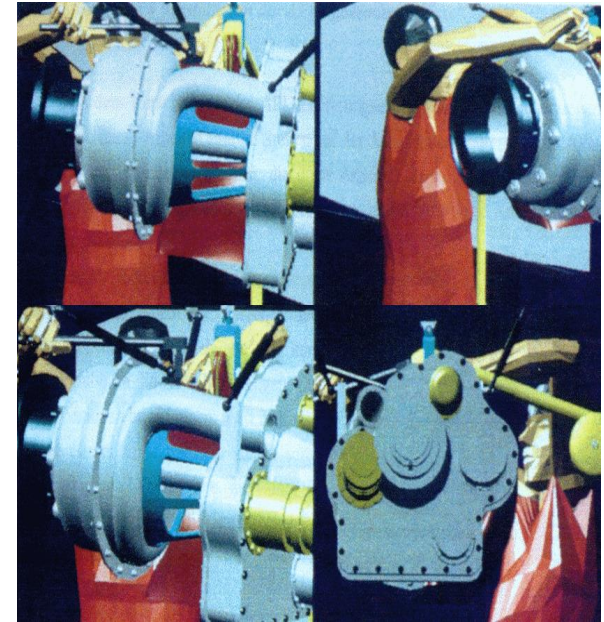
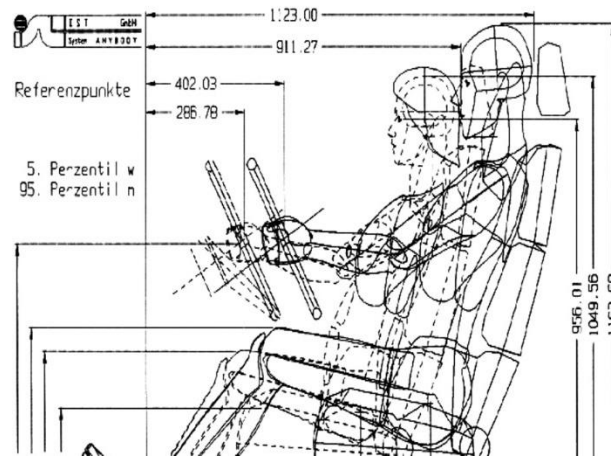
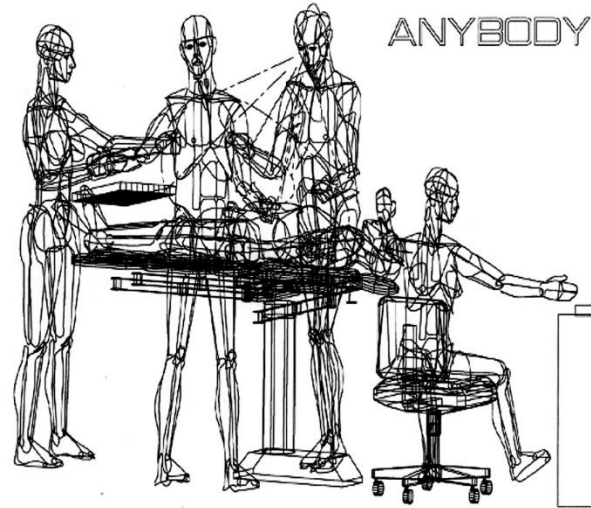
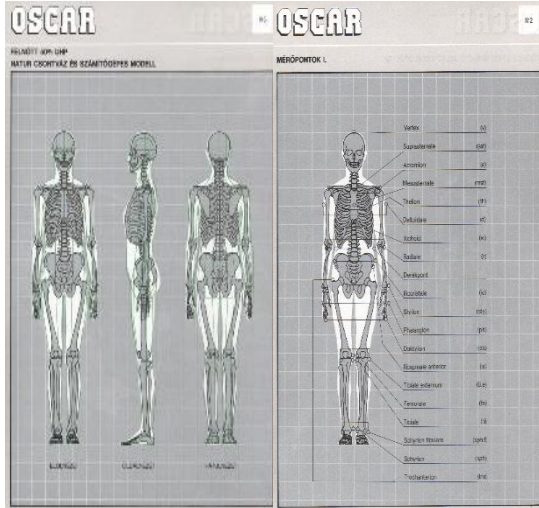
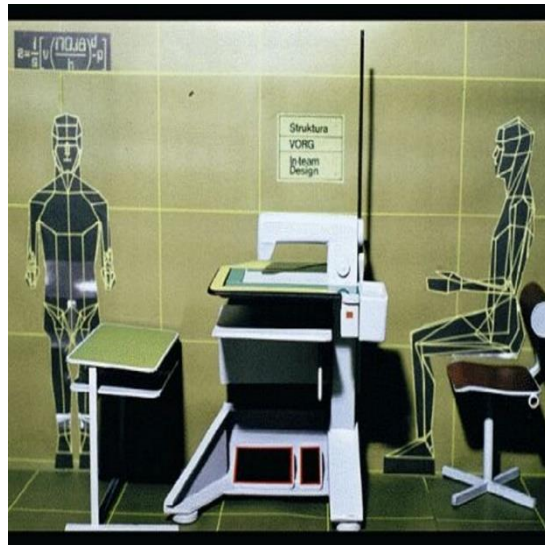




# Motion Capture



# Avatar history (human engineering szoftwares 1981-1989)



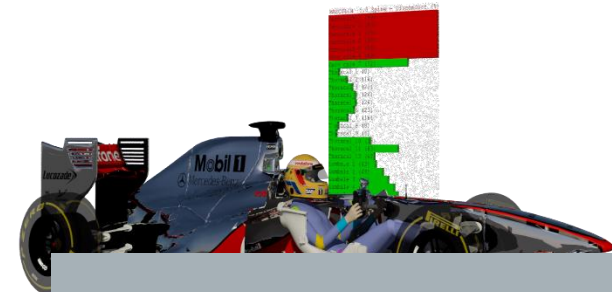
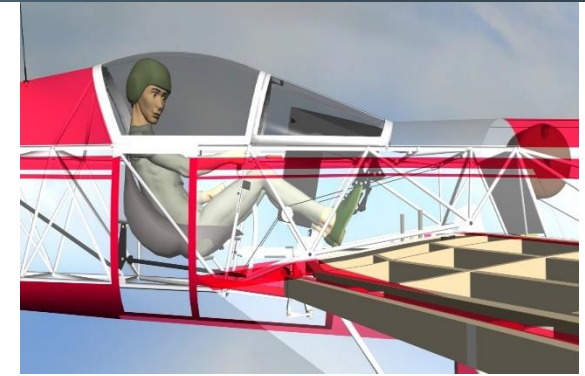
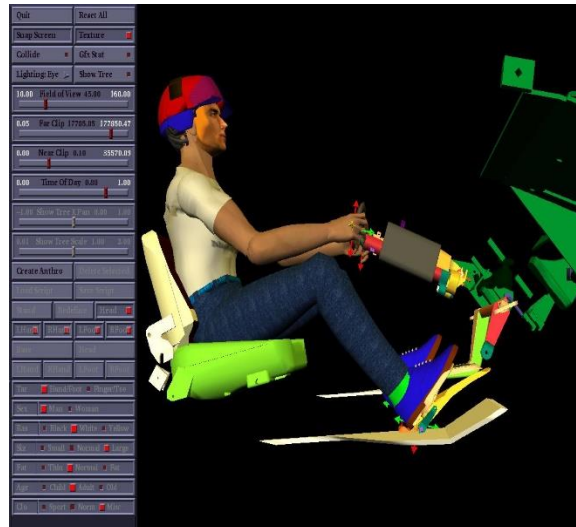
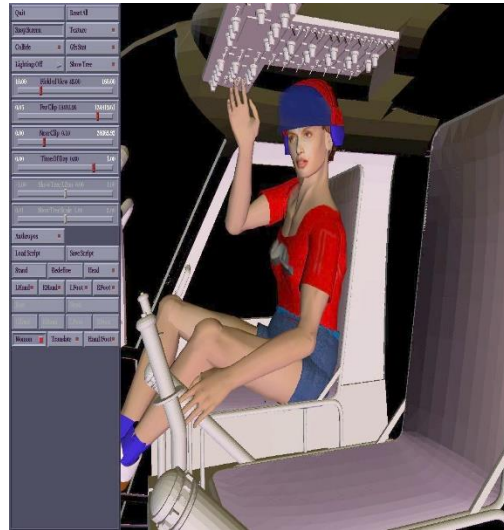
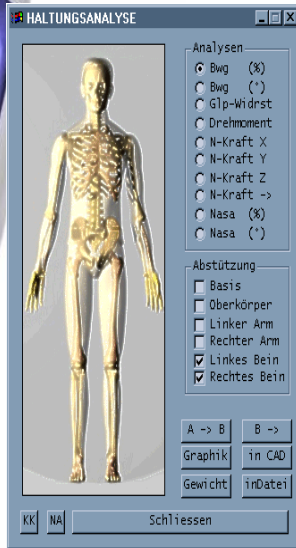
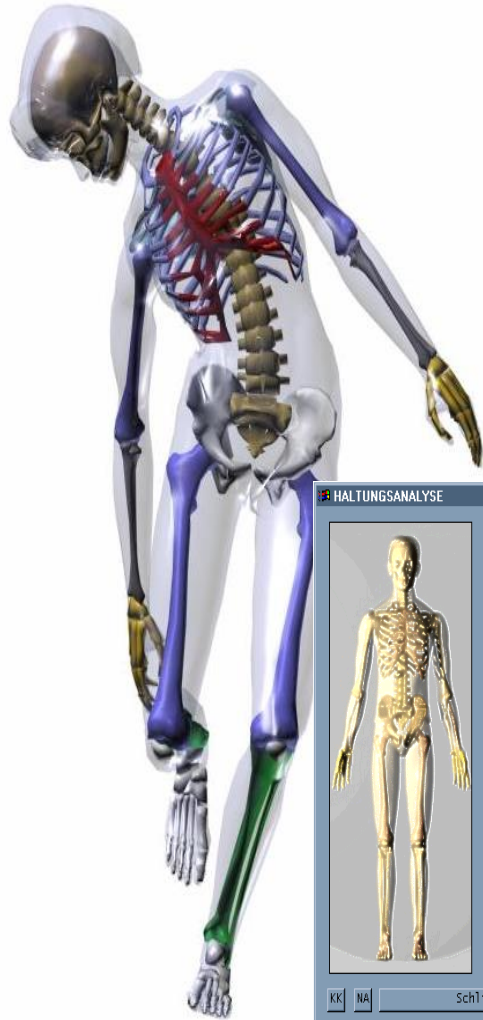
OSCAR 1981-86

Anybody 1987-89

Anthropos 1990-99

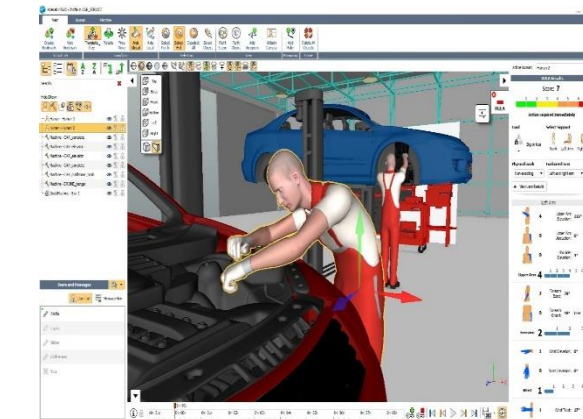
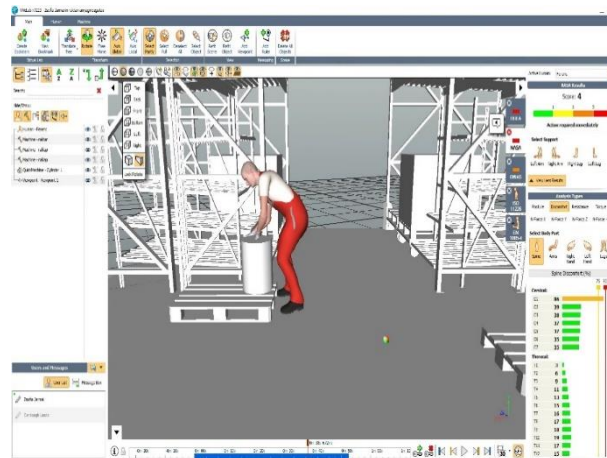
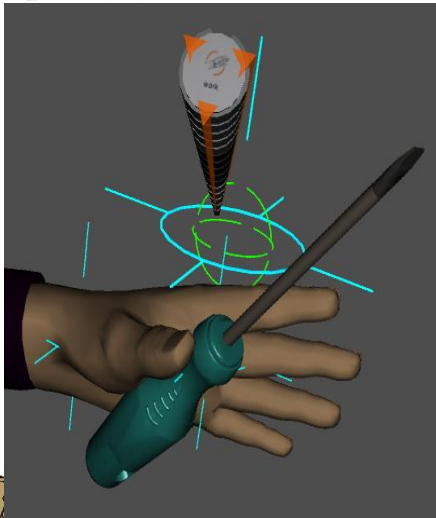
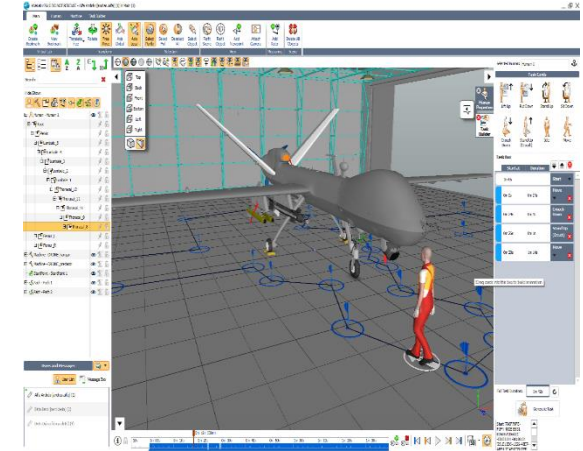
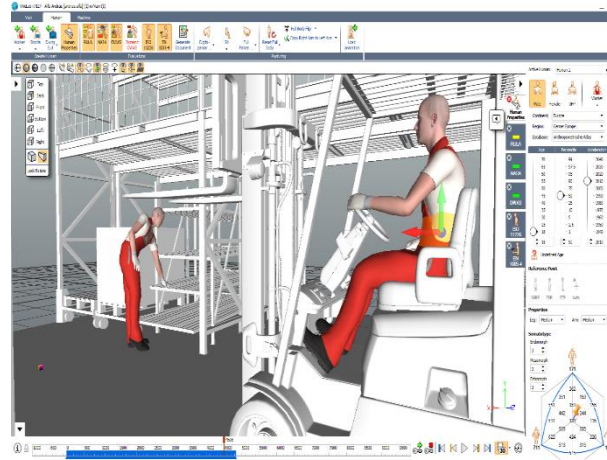
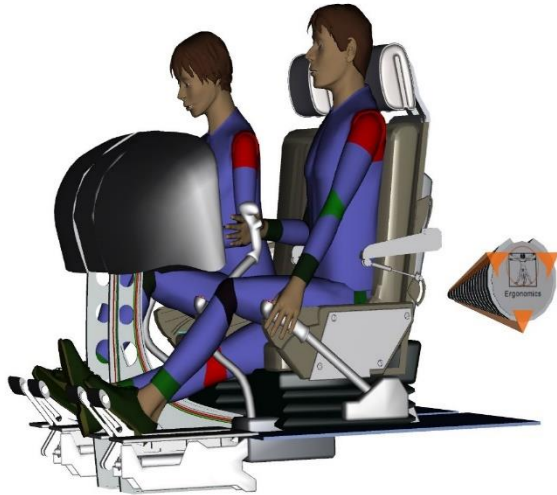


# Avatar history (human engineering softwares 1996-2001)



Ergomax 1999 - 2001    Ergonaut 1996 - 2001    CharAT 2001 -

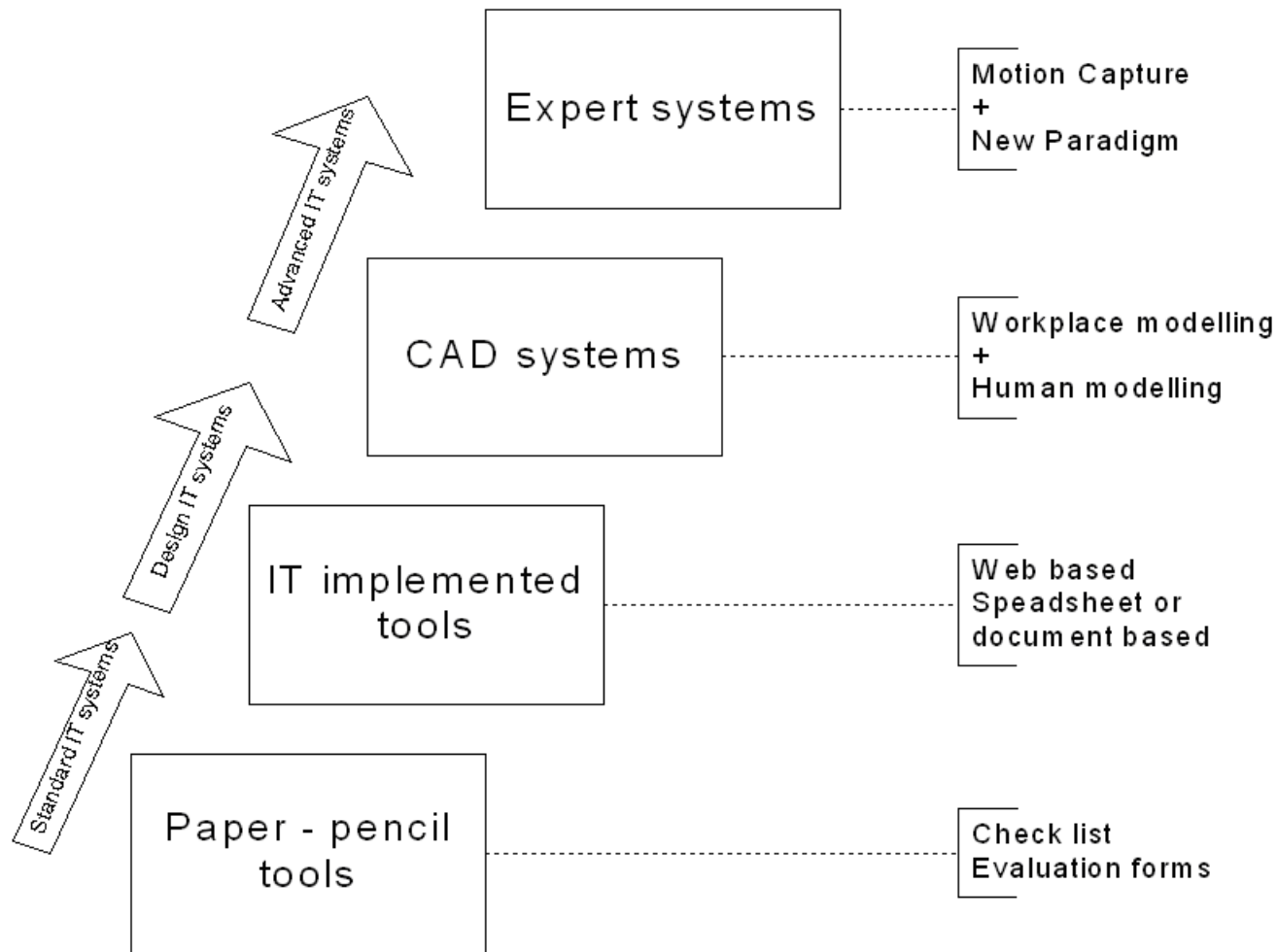
# Avatar history (human engineering softwares 2004-)



IDO-Ergonomics 2004 - ViVeLab - ViVeHuman 2016 -



# Evolution of Ergonomic Risk Assessment Tools



# The background

$$R_{MSD} = \frac{N_{ME}}{T_C * C_{TT} * C_I * C_{BT} * C_E * C_{PH} * C_{MI}}$$

$$F_{Br} = F_B * m_v * m_f * m_d$$

$$M_{ME} = M_{ref} * C_M * C_T * C_V * C_A * C_{MF} * C_F$$



# STUDENT MANUAL

## Ergonomics Essentials

April 2009

Prepared by the International Labour Office  
in collaboration with  
the International Ergonomics Association



International  
Labour  
Office



International  
Ergonomics  
Association

ERGONOMICS

CHECKPOINTS

SECOND  
EDITION

PRACTICAL  
AND EASY-TO-IMPLEMENT  
SOLUTIONS FOR IMPROVING  
SAFETY, HEALTH  
AND WORKING CONDITIONS



KARL H. E. KROEMER

# Fitting the Human

INTRODUCTION TO ERGONOMICS  
Sixth Edition

CRC Press  
Taylor & Francis Group  
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**Thank you for your attention!**

And don't forget to make some good, too.

