12. MODULE
Postures [OWAS]

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INTRODUCTION

Scope of application. The *Postures [OWAS]* module makes it possible to analyse tasks without clearly defined work cycles in which there are awkward postures for the back, the arms and the legs.

Unlike the *Repetitive Tasks* module, which requires knowledge of the exposure time to the different activities performed by the worker during his or her working day, the *Postures [OWAS]* module can be applied to tasks with a workload distribution that is not uniform during the working day and in which it is difficult to determine these exposure times.

Content. In this module the work posture is codified for every given time interval (about 30 seconds of time interval between postures is advisable) to obtain a general view of all the postures adopted during the working period analysed, as well as the risk level (between 1 and 4) associated with each of these.

It is recommended to codify at least 60 work postures. To facilitate this codifying, it is advisable to record a video of the task during a representative time for this (a period of about 30 minutes is recommended).

Source. The module is based on the OWAS method *(Ovako Working Posture Analysing System)* that allows poor postures to be identified and evaluated [Karhu, Kansi and Kuorinka, 1977].

DATA

The analysis is started by selecting the *Postures [OWAS]* module in the *New task* window (Figure 1).

From here one has access to the module's main window (Figure 2) in which the following information is to be entered:
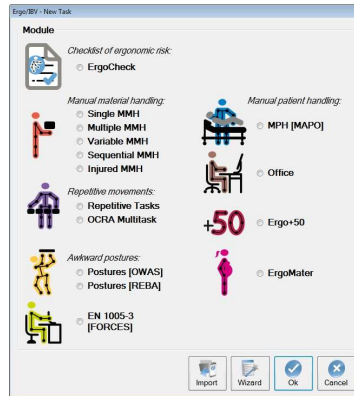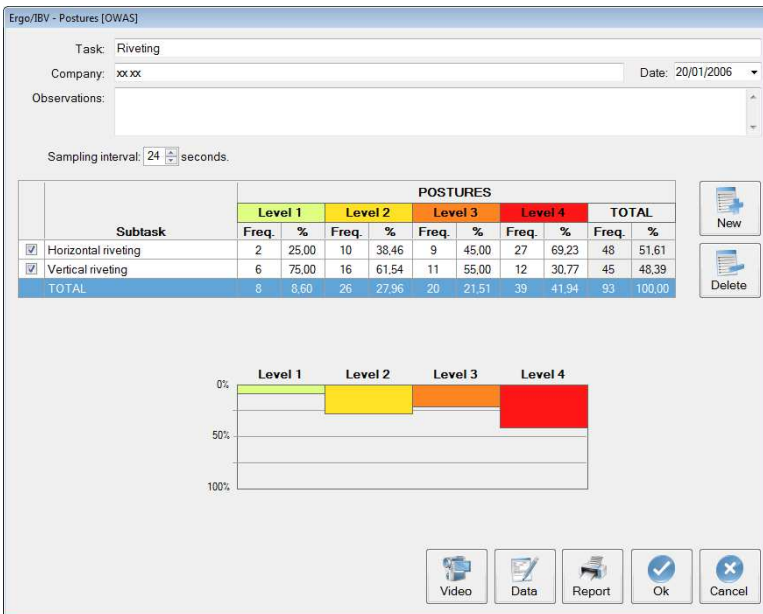

Figure 1: Postures [OWAS] module entry

Figure 2: Postures [OWAS] – Main window

- **Identification**. This refers to the name of the task and the company, the analysis date and the observations of the evaluator.

- **Sampling interval**. The time that has to elapse between one posture and the following, when codifying these, is specified. The program assigns 30 seconds (by default), which is what is recommended, although the evaluator can enter another interval.

- **Subtasks**. The subtasks that make up the task to be analysed have to be defined, as a previous step for codifying postures (as the postures shall be assigned later to a particular subtask). For example, in a task involving the riveting of metal sheeting, it might be interesting to differentiate the risk associated with the postures involved during riveting a horizontal element and those for a vertical one.

  The program offers the list of subtasks in a table which also shows the occurrence frequency (number of times and the corresponding %) of the postures that present each level of risk for each subtask, as well as the totals. For example, in the case of the figure, the horizontal riveting subtask has 27 postures of level 4, which represent 69.23% of the postures of level 4. In addition, a total of 39 (41.94%) postures of the task has a level 4.

  The first column of the table has check-boxes that enable or disable subtasks to interactively refresh the total frequency row. In addition, these check-boxes are used to select the subtasks to be included in the report.

  Under the subtask table there is a vertical bar diagram that indicates percentage and associates color codes for the different risk levels, in order to facilitate their interpretation.

  In addition, there are a number of buttons that allow the following functions:

  - *New:* creates a new subtask.
  - *Delete:* deletes the selected subtask.

Posture codification. Once the subtasks have been defined, clicking the *Data* button (lower part of the main window) accesses the *Data* window (Figure 3) in which the posture is codified. A 'posture' is considered to be a certain combination of the position of the back, arms and legs, together with the force performed in this position. Codifying is made by viewing the **video**

recording of the task and by registering the following for each posture analysed:

- **Back.** Specify the back position by clicking one of the following buttons:
    1. **Straight** (Neutral posture up to approximately 20º)
    2. **Bent** (Flexion or extension posture >20º)
    3. **Twisted** (Torsion or lateral inclination> 20º)
    4. **Bent and twisted**

- **Arms.** Specify the arms position by clicking one of the following buttons:
    1. **Both below shoulder**
    2. **One above shoulder***
    3. **Both above shoulder***

  * The arm or part of the arm is located at or above the shoulder level.

- **Legs.** Specify the legs position by clicking one of the following buttons:
    1. **Sitting** (The weight rests mostly on the person's buttocks. The legs remain below the buttocks.)
    2. **Standing, both legs straight** (The weight of the body is distributed between the two legs. The knee flexion is> 150º)
    3. **Standing, weight on one straight leg** (Standing with one leg straight and the other flexed with the weight unbalanced between both.)
    4. **Standing, both legs bent** (Standing or squatting with both legs flexed and the weight balanced between them. Knee flexion <150º)
    5. **Standing, weight on one bent leg** (Standing or squatting with both legs flexed and weight unbalanced. Knee flexion <150º)
    6. **Kneeling on one or both knees**
    7. **Walking**

- **Force.** Specify the force performed by clicking one of the following buttons:
    1. **10 kg or less**
    2. **Between 10 and 20 kg**
    3. **More than 20 kg**

- **Selected subtask**. Select from the pull-down menu showing the previously defined subtasks the one that the coded posture belongs to.
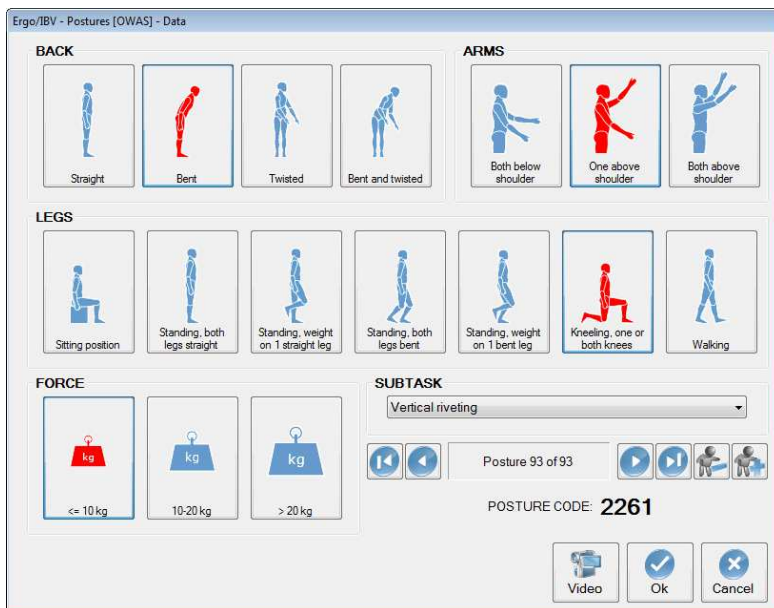
Figure 3: Postures [OWAS] – Data (posture codification)

The *Data* window is, in fact, a database in which the postures are stored, and it is controlled using the bar and the buttons located in the lower part.

- o The bar indicates the current posture number (out of the total codified postures) and has navigation buttons to move to other postures (top, previous, next, bottom).
- o The *Add* button prepares the window for codifying a new posture.
- o The *Delete* button makes it possible to delete the current posture.

Posture code. Appearing in the lower part of the *Data* window is the *code* for the posture entered, in which:

- – the first digit indicates the *Back* position,
- – the second corresponds to the *Arms*,
- – the third to the *Legs* and
- – the fourth to the *Force* performed.

For example, the code 2261 that appears in Figure 3 corresponds to a posture with bent back, one arm above the shoulder, kneeling on one or both knees and with a force of 10 kg or less. As can be seen in the Figure, the options selected when codifying the posture appear highlighted in red.

Time control. As it has been mentioned before, the working posture has to be codified for every given time period as defined in the *sampling interval* (Figure 2). There are two options to control the time:

- If a video player external to the program is used, a chronometer is available to realize this control and it is displayed in the *Time* indicator of the Data window (Figure 3). In this case, one has to find in the video the first posture to be analysed, freeze the image and codify the posture. Clicking the *Add* button starts the chronometer and the evaluator has to start the external video at the same time. Once the time of the sampling interval has elapsed, the chronometer automatically stops, thus indicating that the evaluator has to freeze the video to codify the posture at that moment.
- If the video player of Ergo/IBV is used, the chronometer is not needed any more (in fact, the *Time* indicator of the Data window is hidden). In this case, one has to display the *video player* window by clicking the *Video* button (Figure 3), find the first posture to be analysed, freeze the image and codify the posture. When clicking the *Add* button, the video automatically moves forward the appropriate time (according to the defined sampling interval) and displays a new frozen image which is ready to be codified. As a result, the evaluator do not have to pay attention to control the time and the video, thus making much easier the process for codifying postures.

Once the postures adopted by the worker have been codified, clicking the *Exit* button returns one to the module's main window.

REPORT

Press the Report button to access the report of the task, generated for the subtasks checked in the table, and which consists of several sections:

- **Identification**. This includes the general data (file, date, task and company name and observations), the sampling interval that has been used, and the subtasks considered for the report (specifying if all the postures have been included or it is a selection). If a video source has been configured, an image of the task can also be displayed.

- **Risk levels** (Figure 4). The *Postures [OWAS]* module considers 4 risk levels, their interpretation being as follows:

Level 1	Postures considered normal, with no particular harmful effect. No actions are required.
Level 2	Postures are slightly harmful. Corrective measures should be taken in the near future.
Level 3	Postures are distinctly harmful. Corrective measures should be taken as soon as possible.
Level 4	Postures are extremely harmful. Corrective measures should be taken immediately.

  This section of the report shows the appearance frequency (number and corresponding %) of postures for each risk level and for each included subtask, together with the totals. For example, in the case of Figure 4, the horizontal riveting subtask has 27 level 4 postures representing 69,2% of the level 4 postures. Furthermore, a total of 39 (41,9%) postures in the task have a level 4.

  This information is accompanied by a vertical bar chart (showing the percentages) and associates colour codes for the different risk levels, in order to ease their interpretation.
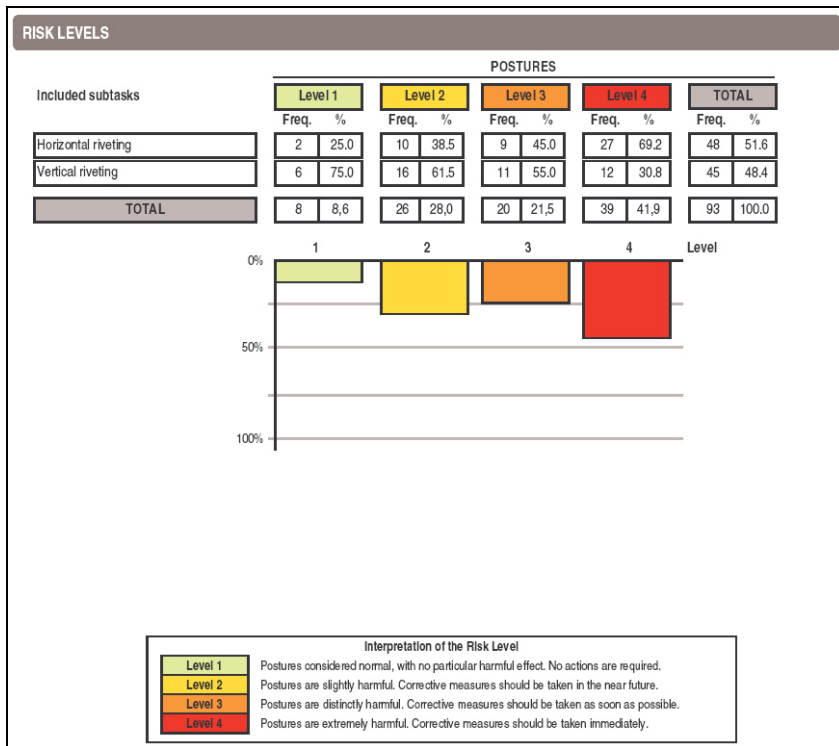
Figure 4: Postures [OWAS] – Report (risk levels)

- **Risk levels of body positions according to their relative frequency** (Figure 5). This section of the report displays the appearance frequency (number and corresponding %) for each of the coded body positions. For example, in the case of Figure 5, one can see that the back is bent in 39 (41,9%) of the codified postures, both arms are below the shoulders in 65 (69,9%) and the force is 10 kg or less in 93 (100%).

  These data are accompanied by a horizontal bar chart, showing the percentages and risk levels for each position. From this information, it is possible to identify which parts of the body bear the greatest load.

RISK LEVELS OF BODY POSITIONS ACCORDING TO THEIR RELATIVE FRECUENCY

Back			
1. Straight	11	11,83	1
2. Bent	39	41,94	2
3. Twisted	2	2,15	3
4. Bent and twisted	41	44,09	4

Arms			
1. Both below shoulder	65	69,89	1
2. One above shoulder	28	30,11	2
3. Both above shoulder	0	0,00	3

Legs			
1. Sitting position	0	0,00	1
2. Standing, both legs straight	8	8,60	2
3. Standing, weight on one straight leg	0	0,00	3
4. Standing, both legs bent	44	47,31	4
5. Standing, weight on one bent leg	0	0,00	5
6. Kneeling on one or both knees	38	40,86	6
7. Walking	3	3,23	7

Force*			
1. 10 kg or less	93	100,00	1
2. Between 10 and 20 kg	0	0,00	2
3. More than 20 kg	0	0,00	3

(*) The OWAS method doesn't have a classification for the relative proportion of the use of force/load handled. In the cases when heavy material handling occurs, the situation must be evaluated separately in each case.
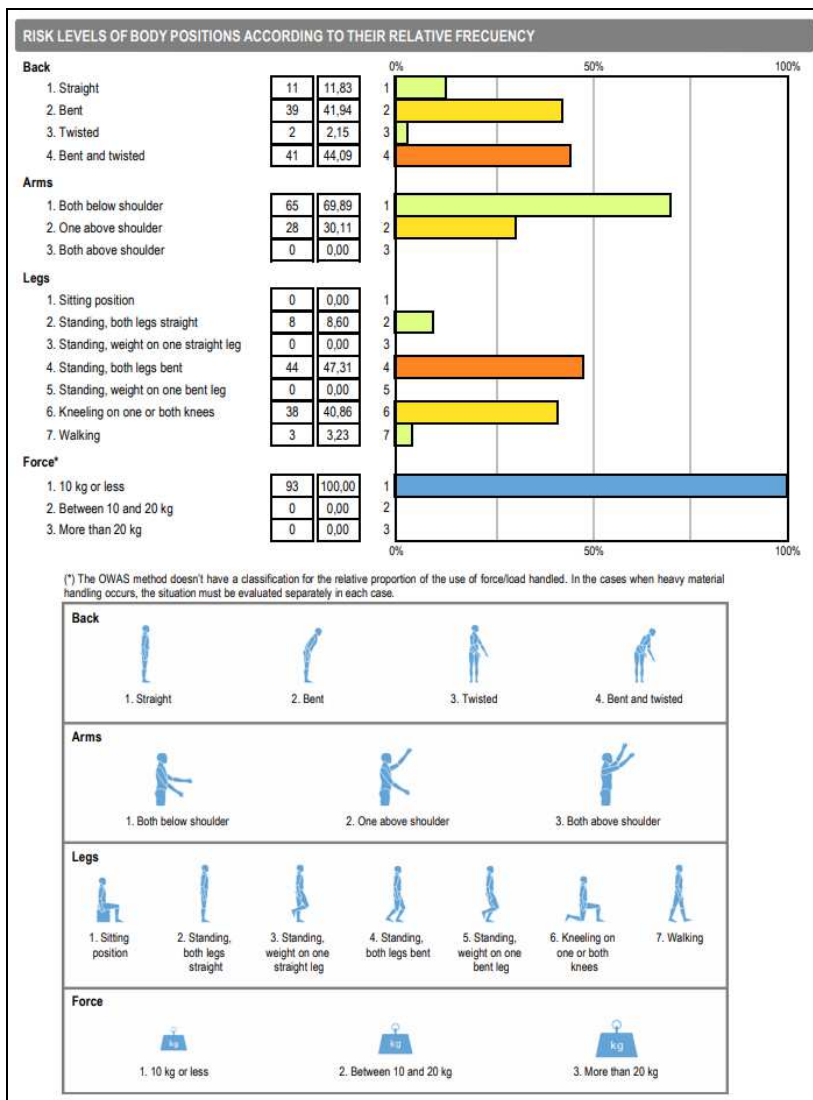
Figure 5: Postures [OWAS] – Report (Risk levels of body positions according to their relative frequency)

- **Postures detail** (Figure 6). Finally, each of the analysed postures (for the subtasks included in the report) is displayed, including the codes, the associated risk level and the appearance frequency (number and corresponding %). Postures are ordered from higher to lower risk level, and within each level they are ordered according to their frequency. Again, the risk levels associate colour codes to ease their interpretation.

  In the example of Figure 6, one can see that the posture with code 4141, which has a risk of level 4, is the most frequent, as it has been codified 24 times (25,8% of total postures). This code corresponds to a posture with the back bent and twisted, both arms bellow the shoulders, standing with both legs bent and with a force of 10 kg or less.

POSTURES detail

POSTURE				Risk Level	Freq.	%
Back	Arms	Legs	Force			
4	1	4	1	4	24	25,8
4	2	6	1	4	11	11,8
4	1	6	1	4	4	4,3
2	1	4	1	3	12	12,9
2	2	4	1	3	3	3,2
2	2	6	1	3	3	3,2
3	1	4	1	3	2	2,2
2	1	6	1	2	13	14,0
2	2	2	1	2	6	6,5
1	1	4	1	2	3	3,2
2	2	7	1	2	1	1,1
4	1	7	1	2	1	1,1
4	2	7	1	2	1	1,1
2	1	2	1	2	1	1,1
1	1	6	1	1	4	4,3
1	2	6	1	1	3	3,2
1	1	2	1	1	1	1,1

Figure 6: Postures [OWAS] – Report (postures detail)