16. MODULE
Postures [REBA]

INTRODUCTION

Scope of application. The module titled Postures [REBA] allows you to analyze tasks that involve poor trunk, neck, upper or lower limbs postures, by means of the *REBA score.*

Contents. The positions to be analyzed for each subtask performed by the worker are selected; generally, the most frequent and/or most arduous working postures are initially chosen. Each analyzed posture requires encoding the position of the different body segments of *group A* (trunk, neck and legs) and *group B* (arms, forearms and wrists), as well as the force, type of grip and muscle activity engaged in that posture. This allows you to obtain a final *REBA score* for the risk level of musculoskeletal injury of a particular posture, which implies a certain *action level* in order to reduce that risk.

Source. The module is based on the REBA method (*Rapid Entire Body Assessment*) for postural analysis, which is applicable to a wide variety of tasks and was developed in the UK [Hignett y McAtamney, 2000].

DATA

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

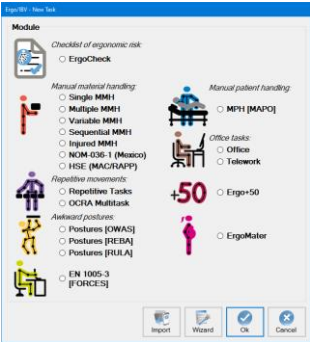This opens the main window of the module (Figure 2), which shows the following:

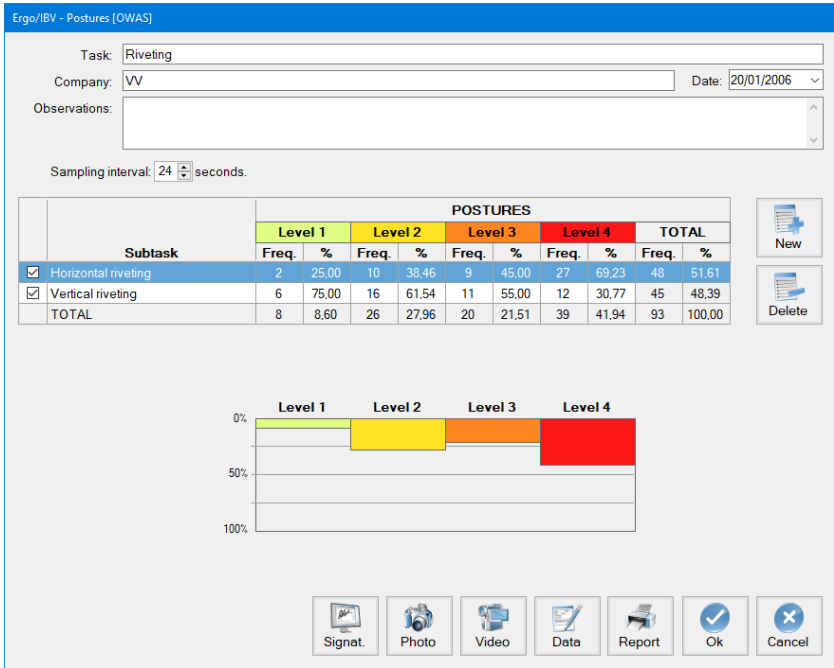Figure 1: Access to the Postures [REBA] module

Figure 2: Postures [REBA] – Main window

- **Identification**. The name of the task and company, analysis date and the observations of the evaluator are recorded.

- **Subtasks**. Each subtask is defined, the postures of which are to be analyzed. For example, Figure 2 shows a laundry task which includes the subtasks of sorting clothes, using the washer machine and the calender ironing machine. The name of each subtask is introduced by pressing the *New* button. The *Delete* button allows you to delete the subtask selected from the list and all the associated postures (asking for confirmation first). The name of a subtask can be changed by directly writing in the corresponding cell.

- **Postures**. The table below summarizes the information about the postures included in the subtask that has been previously selected. For example, Figure 2 shows three postures analyzed in the subtask of using the calender ironing machine.

Postures are managed with the buttons on the right side, the functions of which are as follows:

- o *New*: it accesses the *Posture data* window to create a new posture in the selected subtask.
- o *Edit*: it accesses the *Posture data* window to edit the information of the selected posture.
- o *Delete*: it deletes the selected posture (asking for confirmation first).
- o *Copy*: it copies the selected posture and all the associated data (it may be useful when similar postures that differ in very few data are recorded or when the risk of the posture is reduced by redesigning, as shown later). By pressing this button, the copied posture is added and the same name as the original is assigned by default (indicating that it is a copy). Then you must select this copy, edit the relevant changes and save them by pressing the *OK* button.

How to introduce the information associated with each posture is described below.

Posture data

The *Posture data* window is automatically headed by the name of the subtask, which includes the posture. The header of this window also records the following (Figure 3):

- **Posture**. A name must be assigned to the posture.
- **Frequency**. The frequency of the posture during the workday must be identified: *low* (occasionally), *medium* (often, but it is not the usual posture) or *high* (normal working posture). This is a purely subjective estimate of the evaluator which can be useful when prioritizing the actions required to reduce the risk of the posture.
- **Observations (posture)**. The clarifications on the posture that are considered to be important should be specified.
- **Video reference**. If the task was recorded, the location of the posture in the video should be identified.

Figure 3: Postures [REBA] – Posture data (group A – trunk, neck, legs)

The posture encoding is done in different tabs of this window, as explained below.

A – Trunk, Neck, Legs (Figure 3). The position of the body segments of group A is registered with the help of diagrams.

- **Trunk**. Select one of the buttons in order to specify the trunk position:
  - Extension > 20°
  - Extension up to 20°
  - Upright
  - Flexion up to 20°
  - Flexion 20-60°
  - Flexion > 60°

  Check the applicable box(es) if there is also:
  - Rotation (which includes to the right or to the left)
  - Lateral tilt (which includes to the right or to the left)

- **Neck**. Select one of the buttons to specify the neck position:
  - Extension
  - Flexion 0-20°
  - Flexion > 20°

  Check the applicable box(es) if there is also:
  - Rotation (which includes to the right or to the left)
  - Lateral tilt (which includes to the right or to the left)

- **Legs**. Select one of the buttons to specify the legs position:
  - Bilateral support (standing with equal weight on both legs)
  - Walking
  - Sitting
  - Unilateral support or unstable posture (includes standing with one unsupported or slightly supported leg)

  Check the applicable box(es) if there is also:
  - Knee(s) flexion 30-60°
  - Knee(s) flexion > 60° (except sitting)

B – Arms, Forearms, Wrists (Figure 4). The position of the body segments of group B is also encoded with the help of diagrams. You can analyze the **right** side, the **left** side, or both, by entering the data in the corresponding tab(s); (if both sides are analyzed, the program will only use the most arduous one to calculate the final risk).

- **Arm**. Select one of the buttons to specify the arm position:
    - o Extension > 20°
    - o Extension 20° to flexion 20°
    - o Flexion 20-45°
    - o Flexion 45-90°
    - o Flexion > 90°

  Check the applicable box(es) if there is also:
    - o Arm abduction (lateral movement away from the body)
    - o Arm rotation (which includes the internal or external rotation about the longitudinal axis of the arm)
    - o Shoulder raised
    - o Arm supported or in favor of gravity (It includes the arm supported on a surface or maintaining a forced arm posture with the help of gravity due to the position of the trunk; for example, the arm "hangs" vertically while the trunk is flexed)

- **Forearm**. Select one of the buttons to specify the forearm position:
    - o Flexion < 60°
    - o Flexion 60-100°
    - o Flexion > 100°

- **Wrist**. Select one of the buttons to specify the wrist position:
    - o Flexion/Extension 0-15°
    - o Flexion/Extension > 15°

  Check the applicable box(es) if there is also:
    - o Rotation (which includes pronation or supination)
    - o Lateral deviation (which includes radial or ulnar deviation)

Figure 4: Postures [REBA] – Posture data (group B – arms, forearms, wrists)

Force, Grip, Activity (Figure 5). Besides the position of the body segments, other aspects associated with the position being analyzed should also be recorded. These data are entered as explained below.

- **Force/Load**. Select one of the buttons to specify the force that is being applied or the load being handled:
    - < 5 kg
    - 5-10 kg
    - > 10 kg

    Check the box if there is also:
    - Sudden or abrupt force (which includes those forces that are abruptly applied, such as blows, shakes, etc.)

Figure 5: Postures [REBA] – Posture data (force, grip, activity)

- **Grip**. Select one of the buttons to specify the type of grip of the element being handled:
    - o **Good** (appropriate handle and mid-range power grip)
    - o **Fair** (acceptable but not ideal hand grip, or acceptable grip if a part of the body other than the hand is used)
    - o **Poor** (not acceptable hand grip, although possible)
    - o **Unacceptable** (awkward and unsafe hand grip, without handles, or unacceptable grip when using another part of the body)

- **Activity**. Check the applicable box(es) if the following conditions related to muscle activity exist:
    - o **Static** (one or more body parts are static; for example, they remain in the same position for more than 1 minute)
    - o **Repeated** (actions that are repeated more than 4 times per minute, except walking)

o   Largeand rapid postural changes or unstable base (the action causes significant and rapid changes in posture or the action is performed on a surface that is unstable)

Results (Figure 6). Once the posture is encoded, the last tab shows the assessment results. To do this, the program assigns a series of intermediate scores to the encoding items and finally obtains the **REBA score** that represents the risk of the posture.

Figure 6: Postures [REBA] – Results

The procedure that is applied is explained below:

- The individual scores for each segment of group A and group B are obtained using several tables of values.
- Then the combined score of group A, using Table A, and the combined score of group B using Table B are obtained (if both sides were assessed, the most difficult one is used while the other side is displayed dimmed in the corresponding cells).
- The *force/load* score is added to the resultant value of *Table A* in order to obtain *score A*.
- The *grip* score is added to the resultant value of *Table B* in order to obtain *score B.*
- *Scores A* y *B* are combined using *Table C* in order to obtain *score C*.
- The *activity* score is added to *score C* so as to obtain the final *REBA score*.

In each score cell, in addition to the current value, the *maximum possible value* for that cell is displayed in a small box. This data helps the potential redesign, as seen later.

Depending on the **REBA score** five possible **risk levels** are considered which, in turn, determine a particular **action level** that indicates the urgency of the ergonomic intervention (need to take action in order to reduce the risk), as shown in the following table.

REBA score	Risk level	Action level
1	Negligible	0. Not necessary
2-3	Low	1. May be necessary
4-7	Medium	2. Necessary
8-10	High	3. Necessary soon
11-15	Very high	4. Necessary NOW

Both the *REBA score* and the *risk level* have associated color codes for easy interpretation. Once they are calculated, these results are also shown in the main window of the module, together with the name and frequency of the posture (Figure 2).

REPORT

Pressing the *Report* button at the bottom of the main window opens another window where you can select the postures to be detailed in the optional part of the report (Figure 7). Although all the analyzed postures can be included, they can also be selected according to their risk level.
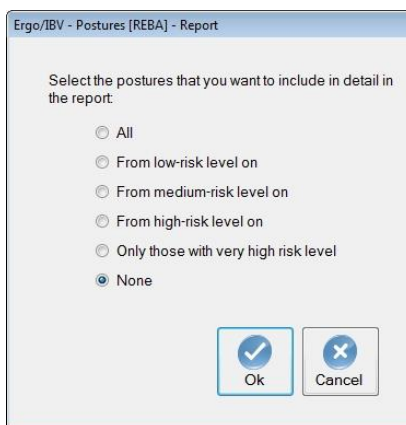
Figure 7: Postures [REBA] – Report (selection of the postures to be detailed)

When the report is configured, you can access the requested report by pressing the *Accept* button, which includes the following:

- **Identification**. It includes general information on the case (date of analysis, name of the task, company and observations of the evaluator). If a photograph was added to the task, it will also appear in this section.

- **Posture risk** (Figure 8). This section is always shown and summarizes the results for all the analyzed postures, grouped according to the subtask to which they belong. Each posture shows its name, estimated frequency and the results obtained for the *REBA score* and the *risk level,* with their color codes. At the end of this section, the interpretation table of the *REBA score* is included (with the five possible risk and action levels already mentioned).

POSTURE RISK

Subtask	Posture		Frequency	REBA Score	Risk Level
Sorting clothes					
	Take the sack		medium	9	High
	Put the sack on the trolley		medium	3	Low
	Remove clothes from the sack		high	3	Low
Washing machine					
	Take clothes from the carriage		high	5	Medium
	Load washing machine		high	7	Medium
Ironed					
	Collect clothes		high	3	Low
	Fold clothes on the table		high	5	Medium
	Store clothes on the self		medium	10	High

REBA score interpretation

REBA Score	Risk Level	Action Level
1	Negligible	0 - None necessary
2-3	Low	1- May be necessary
4-7	Medium	2 - Necessary
8-10	High	3 - Necessary soon
11-15	Very high	4 - Necessary NOW

Evaluator (name and signature)

Figure 8: Postures [REBA] – Report (posture risk)

Posture detail (Figure 9). As already indicated, this section of the report is optional and will depend on the postures previously requested. Each posture is headed by its identification, that is, the subtask where it is included, the posture name, its frequency, observations and the video reference where it is located. The assessment results are then shown, which include all the items recorded in the encoding of the posture, the intermediate scores associated, and the final *REBA score* (including the maximum possible value of each cell) as well as the *risk* and *action levels* for that posture.

POSTURE DETAIL

Subtask	Ironed	Posture	Store clothes on the self

Frequency: medium

Observations (posture): ---   Video reference: ---

Group A

TRUNK
Flexion > 60°
Rot. X   Lateral tilt -   **5** (5)

NECK
Flexion > 20°
Rot. X   Lateral tilt -   **3** (3)

LEGS
Bilateral support
Knee flex. 30-60° X >60° -   **2** (4)

Table A **8** (9)

FORCE / LOAD
< 5 kg
Sudden or abrupt force -   **0** (3)

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Score A **8** (12)

Group B

ARM   Right   Left
Flexion 20-45°   Flexion 45-90°
Abduct. - Rotation X   **3** (6)   Abduct. X Rotation -   **4** (6)
Shoulder raised -   Shoulder raised -
Supported/in favor of gravity -   Supported/in favor of gravity -

FOREARM
Flexion 60-100°   **1** (2)   Flexion < 60°   **2** (2)

WRIST
Flexion/Extension 0-15°   Flexion/Extension > 15°
Rot. - Lateral dev. -   **1** (3)   Rot. - Lateral dev. -   **2** (3)

Table B **6** (9)

COUPLING
Good   **0** (3)

=

Score B **6** (12)

Table C **10** (12)

+

ACTIVITY
Static (sustained > 1 min) -
Repeated (>4 times/min) -   **0** (3)
Postural changes/unstable base -

=

REBA Score **10** (15)

Risk Level	High
Action Level	Necessary soon

Figure 9: Postures [REBA] – Report (detail of the posture)

REDESIGN

The evaluator can use the results window to see how the different scores change as the encoding variables are modified. This can be helpful when redesigning the task or workstation to reduce the risk of a particular posture.

In order to avoid losing the data of the original posture, it is advisable to backup the posture, rename it as a redesign, edit the relevant changes and save it.

In general, we will try to reduce those scores that are closest to its *maximum possible value*. For example, the posture "store clothes on the shelf" (see Figures 3, 4 and 5), has a *REBA score* of 10, which implies a high level of risk, and action is necessary soon (Figure 6). In this case, we can observe that the *activity* is not influencing, the *score A* is closer to its maximum than *score B*, which depends mainly on the trunk and neck (both cells are at their maximum value, 5 and 3, respectively) since the *force/load* is not affecting.

Figure 10 shows a possible redesign of this posture, where the trunk flexion has been reduced (flexion of 20-60°, instead of > 60°), and the trunk and neck rotations have been eliminated. Figure 11 shows the results obtained after these changes: in group A, the scores for the trunk (5 to 3) and neck (3 to 2) have decreased, which results in a *REBA score* of 7 and a medium risk level, action being necessary to reduce the risk. Obviously, the redesign process can continue until the desired risk level is achieved.

Figure 10: Postures [REBA] – Example of redesign (trunk and neck changes)

Figure 11: Postures [REBA] – Example of redesign (new results)