
20. MODULE

Ergo+50

- Introduction
- Data
- Report and recommendations



INTRODUCTION

Scope of application

The Ergo+50 module makes it possible to identify the working conditions (particularly ergonomic aspects, but also organizational and managerial factors) that may pose a problem for older workers.

This module is only applicable to older workers (over 50 years old).

Content

The module contains two questionnaires that are completed independently:

- Questionnaire to **assess the working conditions**. It must be completed by the company and contains items related to the working conditions, workstation, environment, and the organization and management of the work.
- Questionnaire to **assess older workers**. It is individual, voluntary and confidential. This questionnaire must be completed by all the company's older workers. It contains items for these workers to assess their ability to perform the work requirements, and to evaluate the measures of the company in relation to age management.

The module provides a report that includes recommendations to help control the detected risks and, if both questionnaires are completed, information on the relationship between the working conditions and the assessments made by the workers.

Source

The procedure is the result of several research projects and publications developed by the IBV:

- Work and aging. Improvement of the ergonomic working conditions in order to promote healthy aging (ERGOMAYOR).
- Adaptation of workstations for older workers. Good practice guidelines.
- How to design age-friendly workplaces (AGEFRIENDLY-DESIGN).

DATA

The analysis starts by selecting *Ergo+50* in the *New Task* window (Figure 1).

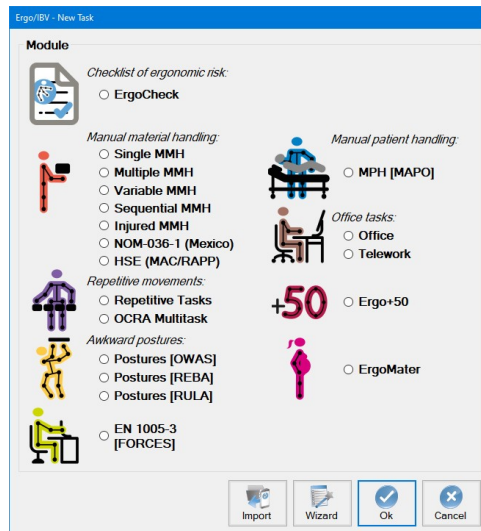


Figure 1. Access to the Ergo+50 module

This opens the main window of the module (Figure 2), where the data of the **task** under analysis are entered, as well as the name of the **company** and the **observations** considered to be relevant.

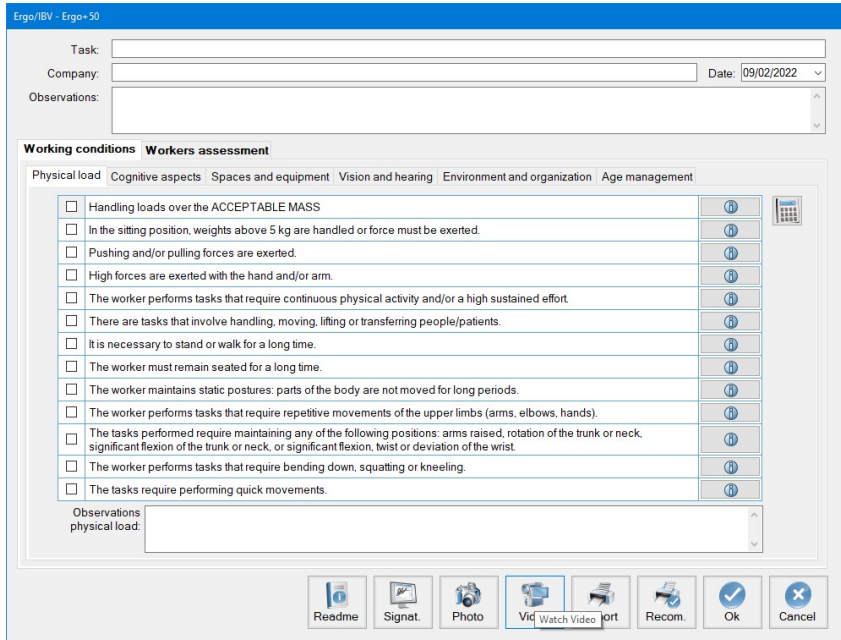


Figure 2. Ergo+50 – Main window

Identification

The data that identify the case are entered in the header of the main window: name of the task, name of the company, date of the analysis, and observations of the person who performs the assessment.

Questionnaires

Under the main window header (Figure 2), select the type of questionnaire to complete:

- Assessment of the **working conditions**
- Older **workers assessment**

Instructions

Pressing the *Read Me* button at the bottom of the main window shows the instructions to use the *Ergo+50* module.

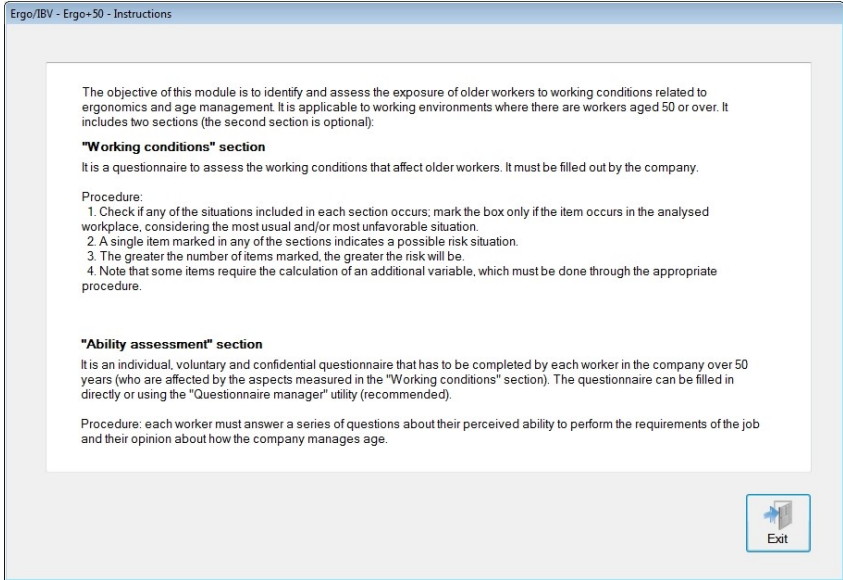
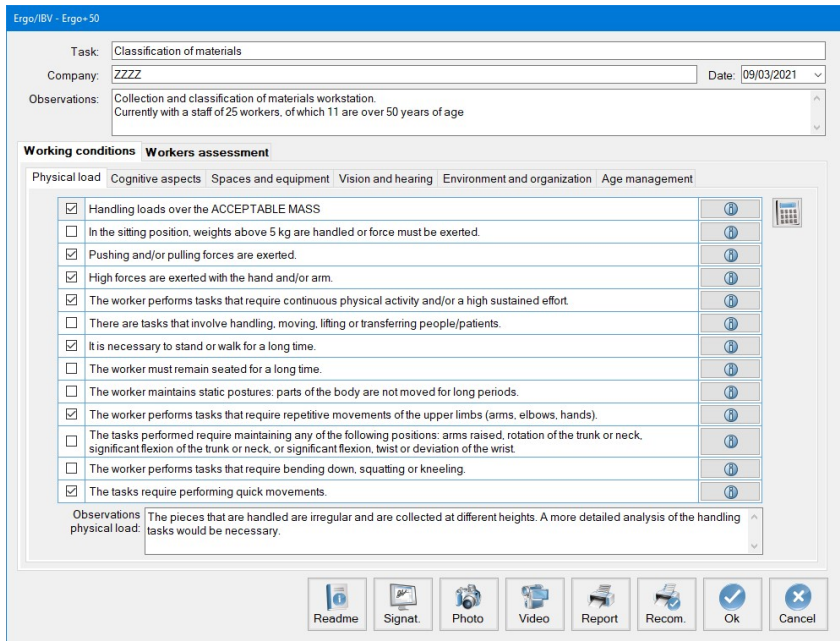


Figure 3. Ergo+50 – Instructions included in the “Read me” button

Assessment of the working conditions

The **Working conditions** option appears selected and the tabs of the questionnaire can be accessed.



The screenshot shows the 'Ergo/IBV - Ergo+50' application interface. At the top, there are input fields for 'Task' (Classification of materials), 'Company' (ZZZZ), and 'Date' (09/03/2021). Below these is an 'Observations' field containing the text: 'Collection and classification of materials workstation. Currently with a staff of 25 workers, of which 11 are over 50 years of age'. The main content area is titled 'Working conditions' and 'Workers assessment'. It features a horizontal tab bar with the following sections: 'Physical load', 'Cognitive aspects', 'Spaces and equipment', 'Vision and hearing', 'Environment and organization', and 'Age management'. The 'Physical load' tab is currently selected. Below the tabs is a list of 12 items, each with a checkbox and a 'Help' icon. The items are:

- Handling loads over the ACCEPTABLE MASS
- In the sitting position, weights above 5 kg are handled or force must be exerted.
- Pushing and/or pulling forces are exerted.
- High forces are exerted with the hand and/or arm.
- The worker performs tasks that require continuous physical activity and/or a high sustained effort.
- There are tasks that involve handling, moving, lifting or transferring people/patients.
- It is necessary to stand or walk for a long time.
- The worker must remain seated for a long time.
- The worker maintains static postures: parts of the body are not moved for long periods.
- The worker performs tasks that require repetitive movements of the upper limbs (arms, elbows, hands).
- The tasks performed require maintaining any of the following positions: arms raised, rotation of the trunk or neck, significant flexion of the trunk or neck, or significant flexion, twist or deviation of the wrist.
- The worker performs tasks that require bending down, squatting or kneeling.
- The tasks require performing quick movements.

 At the bottom of the list, there is an 'Observations physical load' field with the text: 'The pieces that are handled are irregular and are collected at different heights. A more detailed analysis of the handling tasks would be necessary.' At the very bottom of the interface is a toolbar with icons for 'Readme', 'Signat.', 'Photo', 'Video', 'Report', 'Recom.', 'Ok', and 'Cancel'.

Figure 4. Ergo+50 – Questionnaire of the working conditions

Under the header, there are several tabs with the different sections of the questionnaire; clicking on a tab shows the risk factors of each section.

The questionnaire consists of a total of 48 items distributed in 6 sections, which are as follows:


- Section 1: physical load
- Section 2: cognitive aspects
- Section 3: spaces and equipment
- Section 4: vision and hearing
- Section 5: environment and organization
- Section 6: age management

The person who performs the assessment must mark the item when the situations occurs.

To mark some of the items, it is necessary to perform a calculation or to complete an additional questionnaire; such items are specified in the *Calculations* section.

Each section includes an **observations** field in which the user can enter any relevant aspects related to the assessment, clarifications on the items that were marked, or aspects that have been observed but are not included in the evaluated items.

Criteria

Each question of the questionnaire includes a "Criteria" button , which briefly explains the reason why this risk factor must be analyzed and, if necessary, a brief clarification to facilitate the assessment.

Ergo/IBV - Ergo+50 - Criterion

Weights above the acceptable weight are handled.

As a consequence of age, degenerative joint problems appear, and muscle strength reduces. Therefore, handling weight becomes a particularly important problem for older people, since may cause problems such as osteoarthritis, back pain and accidents.

In order to find out if weights higher than the acceptable weight are handled, a calculation of the acceptable weight is proposed based on the weight handled and the handling conditions. Note that for older women these limits should be lower.

If any of the maximum loads is exceeded, a more detailed risk assessment should be performed by applying ergonomic evaluation methods and considering 15 kg as the reference weight under ideal conditions. These analyses can be carried out using the Manual Material Handling modules of Ergo/IBV by selecting the option 'More Protection' in the 'Population' section.




Figure 5. Ergo+50 – Criteria

Calculations


As mentioned above, to mark some of the items, it is necessary to perform a calculation or to complete an additional questionnaire. These items are specified below.

Calculation of the acceptable mass

In this section, the maximum acceptable mass of a load is calculated for the handling conditions of the work.

The procedure used is based on the one proposed by the Technical Guide for the assessment and prevention of risks related to manual material handling [INSHT, 1998], but adapting such procedure for older workers, who are considered population needing greater

protection; consequently, 15 kg is taken as the maximum weight to be handled under ideal conditions.

Pressing the button  next to the "Weights greater than the acceptable mass are handled" item, opens a window where the handling conditions are entered to calculate the acceptable mass.

The program calculates the **acceptable mass** by multiplying the *recommended theoretical mass*, depending on the *handling zone*, by a series of correction factors associated with the *vertical displacement* of the load, *trunk twisting*, *coupling*, *duration* and *frequency* of the handling. Once these data have been entered, the program automatically displays the value of the **acceptable mass** in the corresponding box. Thus, when the actual mass handled in the task is higher than the calculated **acceptable mass** the box preceding the item should be ticked so as to indicate that the risk factor in question exists.

Ergo/IBV - Ergo+50 - Acceptable mass

Handling conditions

Handling zone
(click on the illustration)

Recommended theoretical mass: 7,8 kg

Weight handled kg

Vertical displacement

Trunk twisting

Coupling

Duration

Frequency times/min

Head height	7,8 kg	4,2 kg
Shoulder height	11,4 kg	6,6 kg
Elbow height	15 kg	7,8 kg
Knuckle height	12 kg	7,2 kg
Half leg height	8,4 kg	4,8 kg

ACCEPTABLE MASS kg

The weight handled is greater than the acceptable weight.

Video Empty Ok Cancel

Figure 6. Ergo+50 – Calculation of the acceptable mass

The following data must be entered:

- Handling zone
- Vertical displacement
- Trunk twisting
- Coupling
- Duration
- Frequency

Handling zone. Mark on the figure the area where the load is handled (the distance of the load with respect to the body for

both height and depth). If loads are handled in more than one area, consider the most unfavorable one, for greater safety.

The figure shows the values of the **recommended theoretical mass** according to the handling area, with 15 kg being the maximum value of the ideal position of the load (closed to the body, at a height between the elbow and the knuckles). The further away from the body, the greater the risk of injury and the lower the weight to be handled.

Vertical displacement. In the drop-down menu, select the vertical distance that the load travels from the moment the lifting starts until the handling ends.

Trunk twisting. In the drop-down menu, select the trunk rotation by estimating the angle between the line joining the heels and the line joining the shoulders (Figure 7).

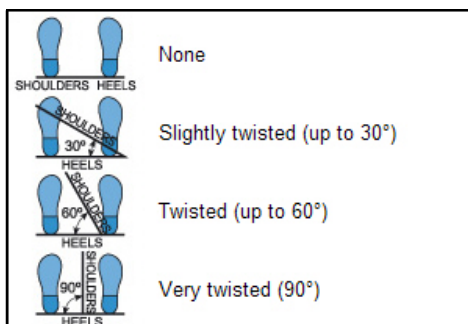


Figure 7: Trunk twisting

Coupling. Select the load coupling from the drop-down menu, taking the following into consideration (Figure 8):

- *Good coupling.* When the load has handles or other type of coupling with a shape and size that permits comfortable coupling with the whole hand, with the wrist remaining in a neutral position, without deviations or unfavourable postures.
- *Fair coupling.* When the load has handles or slits not so optimum, that do not allow such comfortable coupling. It also includes loads without handles that can be held by flexing the hand 90° around the object.

- *Poor coupling.* When the above requirements are not met.

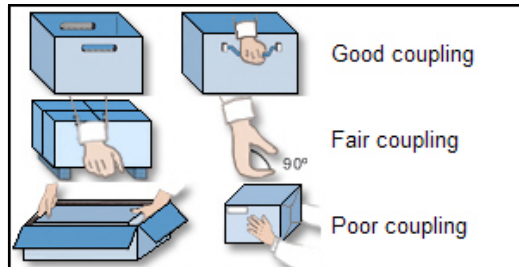


Figure 8: Coupling categories


Duration. In the drop-down menu, select the duration of the load handling:

- Short: work-time ≤ 1 hour
- Moderate: work-time $> 1 - \leq 2$ hours
- Long: work-time $> 2 - \leq 8$ hours

(≤ 1 , 1-2, or 2-8 hours). A long duration can cause fatigue and increases the risk of injury.


Frequency. Enter in the box the frequency with which the load is handled (times/min).

Review of the working tools and instruments

The objective of this section is to verify if the working tools and instruments are appropriate. Pressing the button  next to the item "The characteristics of the working tools and instruments do not provide a comfortable handling", opens a form where all existing conditions must be marked.

If one or more conditions are selected, the item will be automatically marked.

Review of the conditions of the working space

The objective of this section is to verify if the conditions of the working space are appropriate. Pressing the button  next to the


item "The conditions of the working space may cause trips and falls", opens a form where all existing conditions must be marked.

If one or more conditions are selected, the item will be automatically marked.

Lighting levels

This section analyzes if the lighting levels in the workplace are adequate.

The calculation is based on the criteria set out in RD 486/97 (April 14), which establishes the minimum health and safety regulations in the workplace in Annex IV: Lighting in workplaces.

By pressing the button  next to the item "The lighting levels are not suitable for the type of task or space", the user accesses a window where the data necessary to assess the lighting will be entered.

The procedure for the assessment is as follows:

- 1) Indicate the lighting level in lux: the lighting level in the area assessed is measured at the height where the task is performed in a workstation, at 85 cm from the ground in general use areas, or at ground level in walkways with traffic of people.
- 2) Select the area/task: the work area is selected from a list of options according to the visual requirements or the type of area or walkway.

With these data, the software performs calculations and offers three options:

Adequate lighting

Improvable lighting

Unacceptable lighting

If the lighting level is not adequate, the item is automatically marked.

Assessment of older workers

If the option **Workers assessment** is selected in the main window, the user accesses the tabs of the questionnaire.

Task: Classification of materials

Company: ZZZZ Date: 09/03/2021

Observations: Collection and classification of materials workstation. Currently with a staff of 25 workers, of which 11 are over 50 years of age

Working conditions **Workers assessment**

Physical load Cognitive Aspects Vision and hearing Environment and organization Age management

Ability perceived by the worker in the workplace:

	Good	Moderate	Bad
Handling heavy loads (lifting, pushing, pulling).	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Applying force or perform tasks involving intense or prolonged physical activity.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Standing or sitting for a long time or adopting a static posture.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performing repetitive movements or rapid movements with the upper limbs (arms, elbows, hands).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adopting awkward positions with the arms, hands, trunk or neck.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performing tasks that involve bending down, squatting or kneeling.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Reaching objects or elements that are far away.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Handling work tools and equipment.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

questionnaire 11 of 11

Readme Signet Photo Video Report Recom Ok Cancel

Figure 9. Questionnaire for the assessment of older workers

It is an individual, voluntary and confidential questionnaire to be completed by each worker in the company over 50 years (who are affected by the aspects measured in the "Working conditions" section).

Each worker must answer a series of questions about their perceived ability to perform the requirements of the work and their opinion on how the company manages aging.

The questionnaire can be filled directly or using the "Questionnaire manager" utility (recommended option). The application window works as a database in which all the completed questionnaires can be entered and displayed.

The questionnaire database is controlled by the bar below and the buttons located to the right of this area of the window:

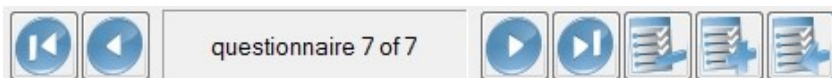





Figure 10. Control bar of the database of the assessment questionnaires for older workers

- The bar shows the number of the active questionnaire (with respect to the total of the current case) and includes buttons to scroll to the other questionnaires of the case (first, previous, next and last).
- The *Import*  button is only used if the evaluator has previously created a study through the web, using the *Questionnaire manager* tool [see chapter 3 of this manual]. It opens a window that allows the user to select an import file (with an **.xml** extension) to automatically incorporate the data into the current case.
- The *Add*  button prepares the window to enter a new questionnaire.
- The *Delete*  button is used to delete the active questionnaire after asking for confirmation.

Anonymity and confidentiality. All the responses to the questionnaire are anonymous and their confidentiality must be guaranteed. The data collected must be used exclusively for preventive purposes and by certified personnel.

Content of the questionnaire

Under the header, there are several tabs with the different sections that make up the questionnaire; clicking on each tab shows the items that the worker has to assess.

The questionnaire consists of a total of 26 items distributed in 5 sections as follows:

- Physical load
- Cognitive aspects
- Vision and hearing
- Environment and working conditions
- Age management

For each item in the first four sections (physical load, cognitive aspects, vision and hearing, environment and working conditions), there are three response options, among which the person who answers the questionnaire must choose one of the following:

- **Good.** I have no limitations / this requirement does not exist in my workplace

- **Moderate.** I can perform it, but with difficulty or discomfort
- **Poor.** It is very hard for me or I cannot

For each item in the last section (age management), there are three response options, among which the person who answers the questionnaire must choose one of the following:

- **I disagree.** These measures are not applied in the company or, even if they are, they do not benefit me
- **Neutral.** They do not affect me or interest me, regardless of whether they are applied or not
- **I agree.** They are applied and benefit me

The **Workers assessment** questionnaire is individual, voluntary and confidential, and must be completed by the older workers. For the questionnaire to be valid, All the items of the questionnaire must be completed.

REPORT AND RECOMMENDATIONS

Report of the results

Once one or both questionnaires have been completed, the report can be accessed by clicking on the Report button in the main window (Figure 2). Such report consists of different sections that will vary according to which questionnaires have been completed.

These sections are:

Identification. The identification section includes the general data of the analysis (date, company and observations of the evaluator) and the name of the task under study. If a photograph was added to the task, it will also appear in this section.

Risk factors. This section of the report refers to the items of the questionnaire for the **Assessment of the working conditions**.

When the questionnaire is completed, this section shows the items marked in an orderly fashion and grouped into categories. If no item was marked, this section appears empty indicating "No risks detected."

In those items for which a calculation was performed (acceptable mass, tools, spaces, lighting), the results obtained in the assessment will be included.

If the questionnaires for the **Assessment of the workers** were also filled out, the results of the comparison between the perceived abilities of the workers and the working condition will appear next to each item.

This comparison can result in different levels of mismatch:

- **Match** (green color): it occurs when the worker considers that they can meet the requirement with no limitations or problems.
- **Moderate mismatch** (yellow color): it occurs when the worker considers that they can meet the requirement with limitations or discomfort.

- **High mismatch** (red color): it occurs when the worker considers that they cannot or that it is hard for them to meet the requirement.

The values show the percentage of each response with respect to the total number of questionnaires.

RISK FACTORS		Match	Moderate mismatch	High mismatch
Physical load				
- Handling loads over the ACCEPTABLE MASS		18,18 %	63,64 %	18,18 %
ACCEPTABLE MASS: 6,23 kg for current handling conditions:				
Handling zone	nearby, between knuckle height and half leg height			
Vertical displacement	up to 50 cm			
Trunk twisting	none			
Coupling	fair			
Duration	moderate			
Frequency	0,500 times/min			
- Pushing and/or pulling forces are exerted		18,18 %	63,64 %	18,18 %
- High forces are exerted with the hand and/or arm		45,45 %	54,55 %	0,00 %
- The worker performs tasks that require continuous physical activity and/or a high sustained effort		45,45 %	54,55 %	0,00 %
- It is necessary to stand or walk for a long time		45,45 %	45,45 %	9,09 %
- The worker performs tasks that require repetitive movements of the upper limbs (arms, elbows, hands)		54,55 %	27,27 %	18,18 %
- The tasks require performing quick movements		54,55 %	27,27 %	18,18 %
<u>Observations</u>				
The pieces that are handled are irregular and are collected at different heights. A more detailed analysis of the handling tasks would be necessary.				
Cognitive aspects				
- The person is exposed to a lot of information and/or stimuli (including those not related to the tasks)		81,82 %	18,18 %	0,00 %

Figure 11. Report: Risk factors and mismatches

Workers assessment. This section of the report includes the items of the questionnaire for the **assessment of older workers**.

If this questionnaire is not completed, this section does not appear in the report.

When one or several questionnaires were completed, this section shows the percentages of responses, in an orderly fashion and grouped into categories. The results will always be presented globally, never individually.

The report includes the number of people who completed the questionnaire and percentage of people who marked each assessment.

RISK IDENTIFICATION REPORT
WORKERS ASSESSMENT

 Number of questionnaires completed

	Good ability	Moderate ability	Poor ability
Physical load			
– Handling loads (lifting, pushing, pulling).	18,18 %	63,64 %	18,18 %
– Applying force or perform tasks involving intense or prolonged physical activity.	45,45 %	54,55 %	0,00 %
– Standing or sitting for a long time or adopting a static posture.	45,45 %	45,45 %	9,09 %
– Performing repetitive movements or rapid movements with the upper limbs (arms, elbows, hands).	54,55 %	27,27 %	18,18 %
– Adopting awkward positions with the arms, hands, trunk or neck.	45,45 %	54,55 %	0,00 %
– Performing tasks that involve bending down, squatting or kneeling.	63,64 %	27,27 %	9,09 %
– Reaching objects or elements that are far away.	63,64 %	27,27 %	9,09 %
– Handling work tools and equipment.	63,64 %	36,36 %	0,00 %
Cognitive aspects			
– Learning new things, memorize or handle a lot of information.	81,82 %	18,18 %	0,00 %
– Making complex and/or quick decisions.	72,73 %	27,27 %	0,00 %
– Focusing on the task, although there are frequent stimuli and distracting elements in the work environment.	54,55 %	36,36 %	9,09 %
Vision and hearing			
– Correctly viewing the information and elements necessary to perform the tasks.	45,45 %	36,36 %	18,18 %
– Correctly hearing signals, warnings and conversations.	27,27 %	36,36 %	36,36 %
Environment and work conditions			
– Tolerating high-noise situations.	27,27 %	36,36 %	36,36 %
– Tolerating situations of great heat or cold, or sudden changes in temperature.	63,64 %	27,27 %	9,09 %
– Tolerating exposure to vibrations (using machines/tools, driving vehicles, etc.).	54,55 %	36,36 %	9,09 %
– Tolerating the work pace imposed.	63,64 %	18,18 %	18,18 %
– Tolerating shift work or night work.	72,73 %	18,18 %	9,09 %
– Spending long time doing the same activity.	81,82 %	18,18 %	0,00 %
– Adapting to organizational changes (introduction of technologies, new work methods, etc.).	72,73 %	18,18 %	9,09 %
Age management			
	I agree	Neutral	I disagree
– The company carries out adequate actions to promote health or to encourage healthy lifestyles.	36,36 %	18,18 %	45,45 %
– Health check-ups are adequate and performed often enough.	45,45 %	27,27 %	27,27 %
– Measures are taken to make it easier for me to return to my tasks after an injury.	63,64 %	18,18 %	18,18 %
– The training offered by the company is adequate for my needs.	45,45 %	27,27 %	27,27 %
– My experience and skills are taken advantage of to improve the company processes and/or to train young workers.	27,27 %	27,27 %	45,45 %
– There are adequate measures and activities to facilitate the transition to retirement.	27,27 %	36,36 %	36,36 %

Figure 12. Report: Workers assessment

Recommendations

Once the questionnaire of the working conditions or both questionnaires are completed, the recommendations can be accessed by pressing the *Recom.* button in the main window (Figure 2).

The items marked in the questionnaire completed by the company are shown together with the recommendations for the company to improve the working conditions and prevent or minimize the risk factors detected.

Although every attempt has been made to offer solutions with a relatively broad scope of application, it is obvious that the needs of a particular case may not be reflected in this report. In fact, the person who performs the assessment must check if these recommendations can be applied to the current case and can propose any other solution to solve the problems detected.

Ergo/IBV
Ergonomic risk assessment

Ergo+50

IBV INSTITUTO DE BIOMECÁNICA DE VALENCIA

RECOMMENDATIONS REPORT

IDENTIFICATION

Date: 02/04/2019

Task: Management and order preparation

Company: ZZZ

Observations:

+50

RECOMMENDATIONS

Physical load

- Weights above the acceptable weight are handled.
 - Do not handle loads above the recommended acceptable weight.
 - Limit the weight handled while under ideal conditions, to a maximum of 15 kg. Ideal conditions include handling the load close to the body, between the height of the feet and the knees, with a straight back, well-supported feet, knees bent, good grip, neutral wrist position, gentle and spaced lifting, and a favorable environment. If any factor prevents these ideal conditions, the weight handled must be reduced.
 - Use mechanical aids such as trolleys or conveyor belts to reduce the manual handling of loads.
 - Automate processes to avoid the manual handling of loads, or use mechanical aids (cranes, manipulators...). If this is not possible, ramps can be used for lighter materials, or a roller conveyor for heavier materials.
- Pushing and/or pulling forces are exerted.
 - Limit the load pushing/pulling force to 18.75 kg (187.5 N) to push a load in motion or to stop it, and 7.5 kg (75 N) to pull a load moving.
 - Reduce by 25% the force levels in pushing or pulling tasks that are applicable to the general population.
 - Train all the workers who perform or could perform pushing or pulling tasks in the techniques to perform them correctly.
- High forces are exerted with the hand and/or arm.
 - Reduce the force required to handle work equipment. For example, by using lever-type mechanisms when operating controls, or using tools with long handles, which provides a mechanical advantage when applying forces.
 - Use specific tools adapted to the task to be performed. For example, tools with different handle designs suitable for various tasks, so that these can be performed keeping the wrist straight.
 - Use power tools instead of manual tools in order to reduce the repetitiveness of movements or the force exerted with the hand.
 - Use counterweight systems to hang heavy tools.
- Tasks that require great and continuous activity/effort are exerted.
 - Avoid work that involves significant and continuous physical effort, high energy consumption, high heart rate increase...
 - Combine tasks that require dynamic efforts with others that require static efforts. Combining both types of effort can help to keep energy consumption and heart rate within the acceptable limits.
 - The efforts required must be compatible with the worker physical ability. If the demands are excessive, auxiliary energy sources (tools, vehicles, etc.) must be introduced in the workplace.
 - Include breaks to relieve the fatigue caused by the workload, not only the physical load, but also the sensory and/or mental one. The more static the effort is, the more frequent and/or long the breaks must be.
 - Recommend leisure-time exercises suitable for people who perform physically demanding jobs.
- It is necessary to stand or walk for a long time.
 - Avoid jobs that require prolonged standing. Avoid standing for longer than 4 hours a day in a fixed position or combined with displacements.
 - Provide trolleys or supports for the sensor to sit or lean on.
 - Use suitable footwear: lightweight, flexible and porous (allowing transpiration).
 - Use anti-fatigue floor mat systems.
 - Have breaks that allow the worker to recover from the accumulated fatigue.
 - Do regular stretching and muscle relaxation exercises.
 - Promote the practice of physical exercises. Training in exercises that strengthen the abdominal and lumbar area, as well as and lower limbs.

Instituto de Biomecánica de Valencia Page 1

Figure 13. Recommendations report