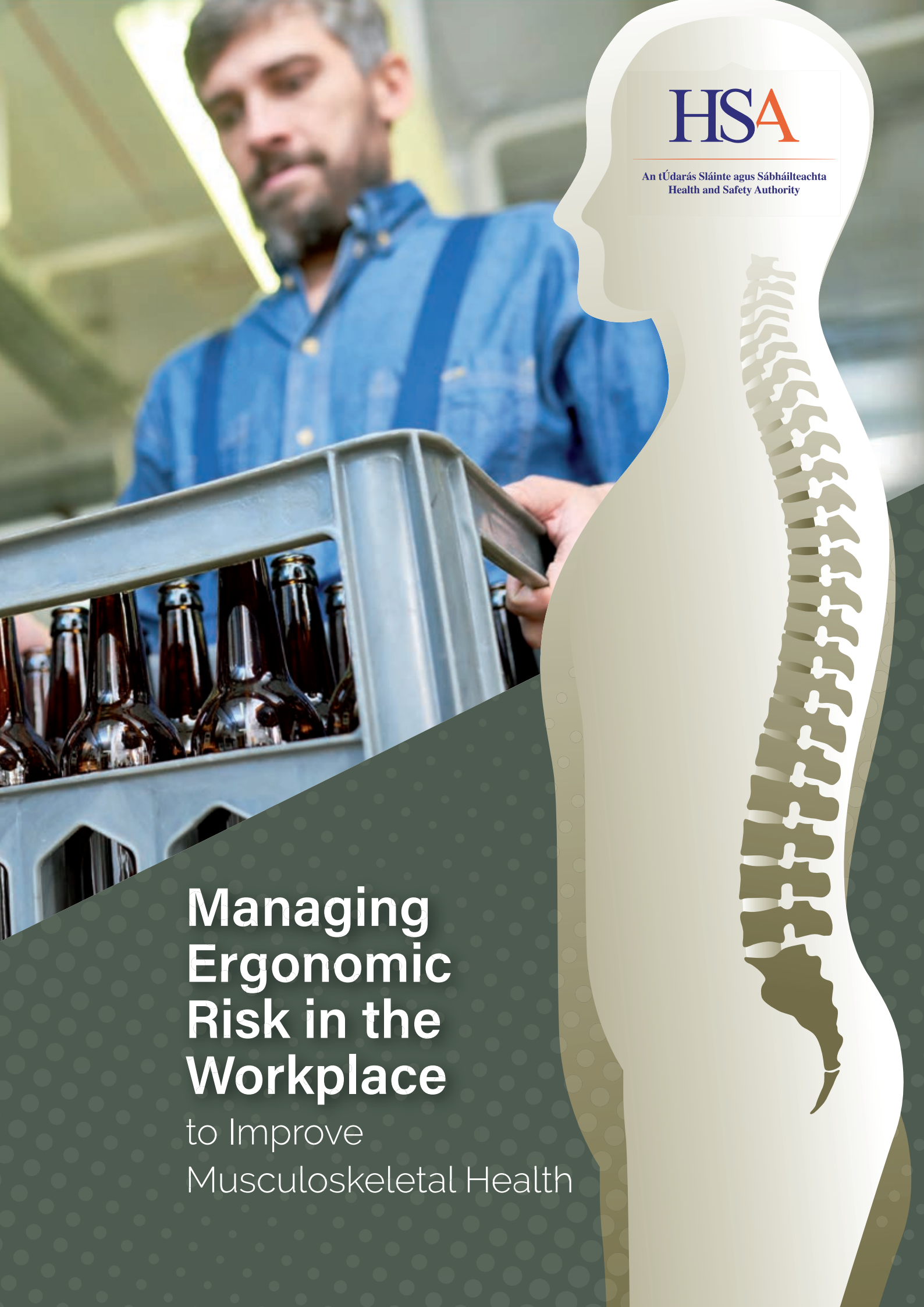

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Health and Safety Authority

Managing Ergonomic Risk in the Workplace

to Improve Musculoskeletal Health

Our Vision: Healthy, safe and productive lives and enterprises

An tÚdarás Sláinte agus Sábháilteachta
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Contents

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WHAT IS ERGONOMICS?

Ergonomics is about designing or planning work tasks in such a way as to improve human health, comfort and performance.

Ergonomics in practice involves a study of work activities and the work environment in order to understand how people carry out the work activities. Human performance is affected by:

- **Physical ergonomics:** the physical requirements of an activity
- **Cognitive ergonomics:** the way information in relation to the task is presented to the person
- **Organisational ergonomics:** how work is organised, for example shift patterns

This guide relates to physical ergonomics and is designed to help employers to manage ergonomic risks that affect the musculoskeletal system.

The **musculoskeletal system** is a combination of the muscular and skeletal systems, which work together to allow the body to move and perform activities. It consists of muscles, tendons, ligaments, nerves, blood vessels and supporting tissues.

Evidence-based information is used to study a work activity in order to assess both human comfort and physical capability to complete the task. Having studied the activity, opportunities to redesign or change the task to allow the person to carry it out without detriment to their musculoskeletal health should be considered.

Musculoskeletal disorders (MSDs) are injuries or disorders that affect any part of the musculoskeletal system. MSDs are associated with ergonomic risk factors such as excessive force, awkward posture and repetition. Symptoms of MSDs can include aches and pains, swelling, numbness and weakness.

It is useful to look at an example of ergonomics in practice. Figures 1 and 1a show a work activity that involves a person manually lifting a metal part (a billet) into a CNC machine for drilling. The ergonomic risk factors include the heavy weight of the billet (up to 130kg) and the awkward twisting posture involved in the manual transfer of the metal part into the machine, which results in the load having to be manipulated at a distance from the trunk. It is clear that carrying out this task exposes the worker to physical stress due to these ergonomic risk factors.

Figure 1

Figure 1a

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WHAT IS ERGONOMICS? cont'd

Good ergonomic interventions will reduce the adverse health effects on the person who carries out the task and can positively impact their ability to carry out the work activity effectively. Figure 2 shows an innovative engineering intervention that was implemented to eliminate the need for the worker to manually lift the heavy part into the CNC machine. This intervention was developed and introduced through consultation with the people who do the task. A custom-engineered billet loader was fixed to the floor at each CNC machine centre and, most importantly, all operators were trained on its use. The billet loader eliminates the manual lifting of the billet and the billet loader can be operated with a neutral standing posture.

Figure 2

As the above example illustrates, good ergonomic practice ensures that work activities take account of the human input in completing the work task by:

- studying how the task is carried out,
- identifying ergonomic risk factors and recognising their impact on human health, and
- making engineering and/or organisational interventions to minimise or eliminate these risk factors.

Many workplaces fail to place sufficient emphasis on managing ergonomic risk. Where there is an intervention for risk reduction, it is often limited to the provision of manual handling training on safe-lifting techniques. Such training is important, but it is evident from the example above that manual handling training would have had no impact in avoiding or reducing the risk of injury involved in lifting the heavy metal part into the CNC machine.

This guide gives direction on the actions that need to be taken in order to manage ergonomic risks at workplace level. It explains the main ergonomic risk factors that may affect a person's health when carrying out work activities, outlines the risk assessment process involved in managing ergonomic risks, and gives guidance on useful risk assessment tools that can be used to quantify ergonomic risk factors.

WHY IS IT IMPORTANT TO MANAGE ERGONOMIC RISK?

There are a number of reasons why ergonomic risk factors need to be managed, including the protection of human health, improving worker performance and requirements under Irish law.

Employers have a legal duty to manage ergonomic risk in the workplace and to put appropriate measures in place to avoid or reduce risk of musculoskeletal injury. It is essential to remember that a number of Irish laws require the employer to manage and address ergonomic risk factors. These include:

- The Safety, Health and Welfare at Work Act 2005 and the associated Schedule 3: General Principles of Prevention require employers to manage and conduct work activities in such a way as to ensure the safety and health of their employees; to provide systems of work that are planned, performed and revised as appropriate to be without risk to health; and to implement measures for the protection of the safety and health of their employees.
- Chapter 4: Manual Handling of Loads of the Safety, Health and Welfare at Work (General Application Regulations) 2007 places a duty on employers to manage ergonomic risks in relation to work activities that involve manual handing.
- Chapter 5: Display Screen Equipment of the Safety, Health and Welfare at Work (General Application Regulations) 2007 places a duty on employers to manage ergonomic risks in relation to work activities that involve working at computer workstations.
- Schedule 1, Annex 1 to Directive 2006/42/EC of SI No. 407 of 2008 specifically refers to the need for good ergonomics in relation to machinery being purchased such as allowing for the variability of the operator's physical dimensions, strength and stamina.

Accident and ill health statistics for the Irish workplace also highlight the need for more effective management of ergonomic risk in the workplace. For example:

- 8,381 non-fatal injuries were reported to the Health and Safety Authority in 2016 and one in every three of those injuries involved workers carrying out a manual handling task in the workplace that resulted in a musculoskeletal injury.
- The Economic and Social Research Institute reports that MSDs accounted for half of all work-related illnesses in Ireland over the period 2002 to 2013.
- Department of Social Protection figures show that in 2017 there were 10,739 occupational injury benefit claims awarded to people who were injured at work; 25.96% of the claims were attributed to those with back, neck, rib and disc injuries.

These statistics reveal the extent of personal suffering caused by work-related accidents and ill health and the consequent loss to organisations in terms of staff being unavailable for work and reduced productivity. Clearly, it makes good business sense to manage ergonomic risk in the workplace.

WHAT ARE THE MAIN ERGONOMIC RISK FACTORS?

This section explains the main ergonomic risk factors and examines their impact on human health with the use of examples from workplace settings.

Physical ergonomic risk factors can be harmful to the body and can lead to people developing a musculoskeletal injury or illness. There are many physical ergonomic risk factors, including:

- force, for example a heavy load that has to be lifted, pushed, pulled or carried,
- awkward posture, for example twisting, reaching or bending,
- repetition and lack of recovery time,
- static work, and
- environmental factors, for example lack of space, uneven work surfaces, poor workstation design, poor lighting.

The examples below illustrate the main ergonomic risk factors that can impact on people's ability to carry out work activities effectively, efficiently and with minimal risk of injury.

Force

It is essential to collect the facts on the type of load being handled by those engaged in a manual handling task, specifically the weight and size of the load.

The main problems with work activities where there is a requirement to lift heavy loads are the excessive loading of the muscles and also the wear and tear on the back, especially on the lumbar intervertebral discs. The increased force due to the manual lifting of a heavy load brings about a sudden and steep increase in internal pressure in the discs and can quickly overload them. The force from a lifted load becomes ten times larger in the spine.

Several studies have indicated that during lifting, the largest forces are created in the trunk, and the discs in the lower lumbar area (particularly L5/S1 disc) are at greatest risk. The greater the force or weight of load that is lifted, the larger the compressive forces on the spine and the greater the risk to the discs in the lower back.

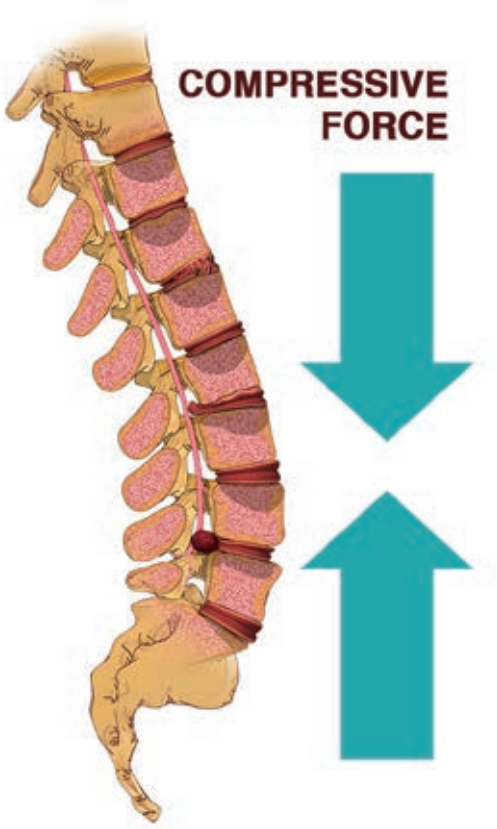

Figure 3

WHAT ARE THE MAIN ERGONOMIC RISK FACTORS? cont'd

As the muscle effort increases due to heavy load forces, circulation to the muscle decreases and this causes more rapid muscle fatigue. If there is no recovery time, there is a likelihood of soft tissue injuries, particularly if load weights are significant.

Figure 4 illustrates the ergonomic risk factor of force. Two construction workers are required to manually lift a stone cladding unit that weighs 80kg and then hold it in position while it is being fixed to the wall edge. This work activity results in sustained large compressive forces on the trunk and puts those workers at risk of injury.

Figure 4

To eliminate or minimise the risk of injury, appropriate measures need to be taken to make the activity safe. In Figure 5, human health, comfort and performance for this activity have been improved with the introduction of a vacuum handling system to take the weight of the stone cladding unit – this is an excellent example of good ergonomic practice.

Figure 5

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WHAT ARE THE MAIN ERGONOMIC RISK FACTORS? cont'd

Awkward posture

An individual's posture and their range and type of movement are important aspects in carrying out work activities. Posture and movements are often imposed by the task and the workplace environment. The body's muscles, tendons, ligaments and joints are all involved when adopting a posture, carrying out a movement and applying a force. Poor or awkward posture can lead to local mechanical stress on the muscles, ligaments and joints, which in turn results in complaints of the neck, shoulder and other parts of the musculoskeletal system.

When maintaining a posture or moving, the joints ought to be kept in the neutral position (see Figure 6), as far as possible. In the neutral position, the muscles and ligaments that span the joints are stretched to the least possible extent.

Figure 6

Examples of poor postures while lifting include raised arms and/or a bent and twisted trunk. In such postures, the joints are not in a neutral position. The work task depicted in Figure 7 requires the person to engage in an awkward posture: lifting and manipulating a load above head height puts increased pressure on the back muscles.

Figure 7

WHAT ARE THE MAIN ERGONOMIC RISK FACTORS? cont'd

Apart from lifting a load above head height, the person in Figure 7 must also hold the load away from the body as it is not possible to hold it close to the body. This factor worsens the situation because holding a load at arm's length imposes about five times the stress experienced when holding the same load very close to the body (see Figure 8).

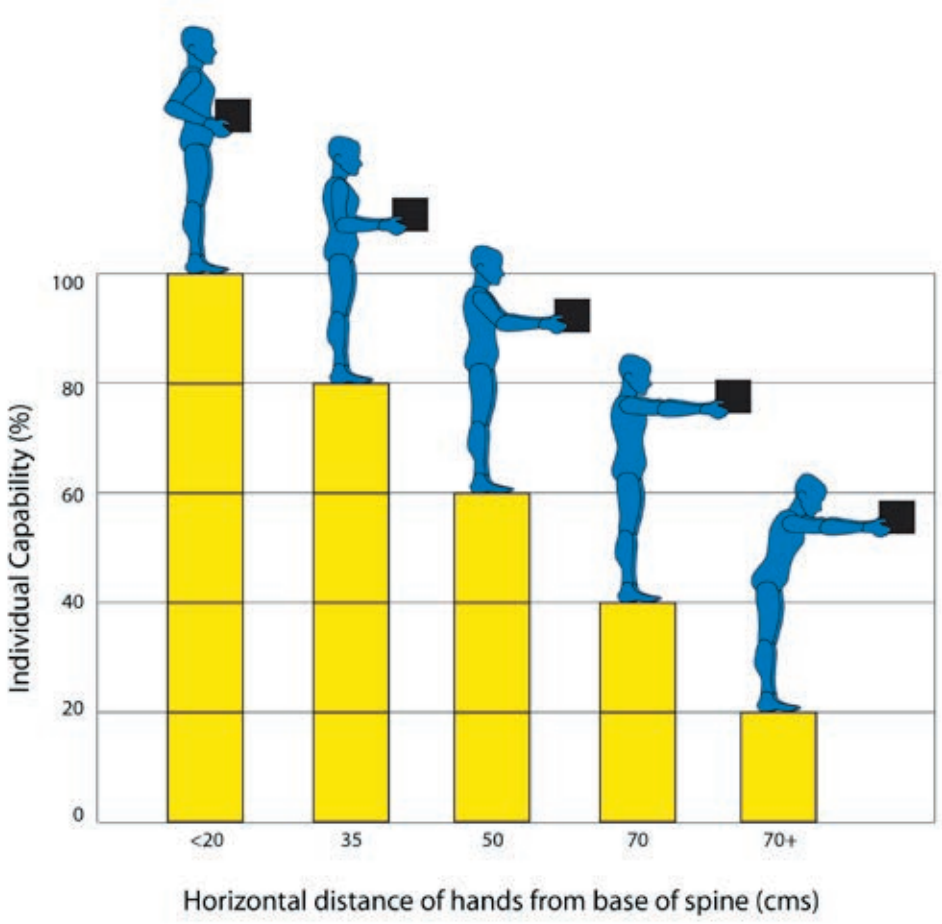

Figure 8

Repetition and lack of recovery time

The human body is not designed for highly repetitive actions. Doing the same activity over and over again, using the same muscles, tendons and joints, can result in injury. The more repetitive the task, the more rapid and frequent are the muscle contractions. Therefore, tasks requiring high rates of repetition involve more

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WHAT ARE THE MAIN ERGONOMIC RISK FACTORS? cont'd

muscular effort and require more time for recovery.

The human body has great powers of recovery if given sufficient intervals of rest time between periods of repetitive work. When the recovery time is insufficient, and when high repetition is combined with forceful and awkward posture, the person is at greater risk of developing a musculoskeletal injury. A workplace where workers are picking orders from storage locations and placing them onto trolleys would be an example of a work activity involving repetitive handling activities over a long duration. Another example might be work at a computer workstation where there is repetitive inputting of data.

To address the ergonomic risk factor of repetition, it is important that efforts are made to assess the workplace set-up and to review the work activities to allow time for recovery. Breaks in physical work that provide recovery and rest periods are essential with very physically repetitive work activity. As recovery is steepest at the beginning of a break, providing more breaks of short duration is more beneficial than allowing a few longer interruptions.

Static work

Static work involves maintaining the same posture for a long period. Static loading of the muscles requires continuous muscle contraction, which can result in reduced blood flow to the muscles and muscle compression and lead to increased fatigue. Such fatigue often forces an individual to abandon the tiring static posture to relax and recover – this is generally achieved by the person introducing 'disguised breaks'. It makes good sense, for both the operator's health and business productivity, to design tasks in such a way that they allow the person to move about and adjust their posture.

An example of a static work activity is where a person is required to pick and place loads during a packing operation, as shown in Figure 9. When filling the box on the conveyor, the operator is required to stand in one position for extended periods of time. When the box is full, the operator moves the box of product to a pallet that has been positioned very close to the conveyor, resulting in limited movement and the need to twist the body to access the pallet.

A possible solution to reduce the risks of static loading and the twisting movement could be the introduction of a variable-height pallet truck and the positioning of that pallet truck far enough away from the operator to allow adequate movement when transferring the boxes to the pallet. This intervention would reduce the duration of static posture, eliminate the twisting and bending postures and increase body movement.

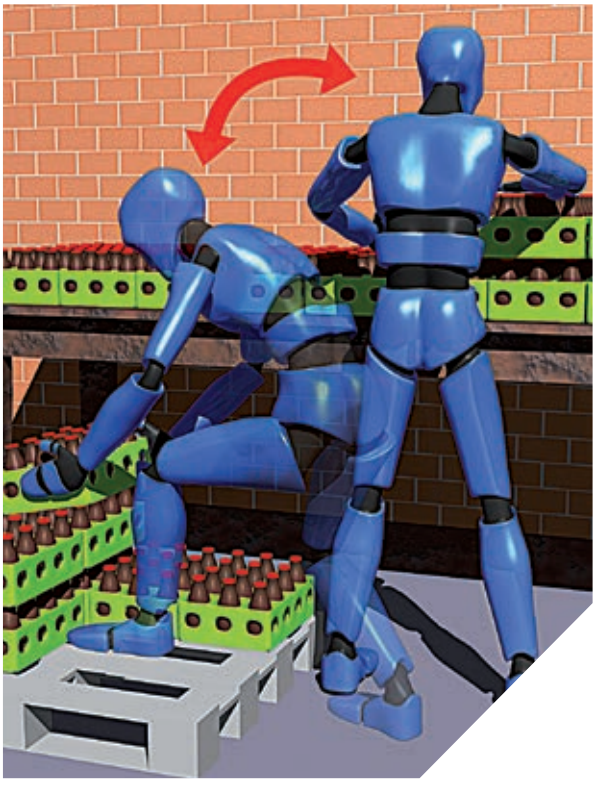

Figure 9

WHAT ARE THE MAIN ERGONOMIC RISK FACTORS? cont'd

Environmental factors

Environmental factors that increase ergonomic risk include lack of space, an uneven floor, ramps and poor workstation design. Restricted space will result in adopting a stooped posture and obstructions may increase the need for twisting, reaching or leaning.

Taking workstation design as an example, it is necessary to limit the extent of forward and sideways reaches to avoid having to bend or twist the trunk. Work equipment, tools and controls that are in regular use should be located directly in front of or near the body.

Figure 10 shows a work area that has been set up to ensure that items are within each reach, this is sometimes referred to as the zone of convenient reach.

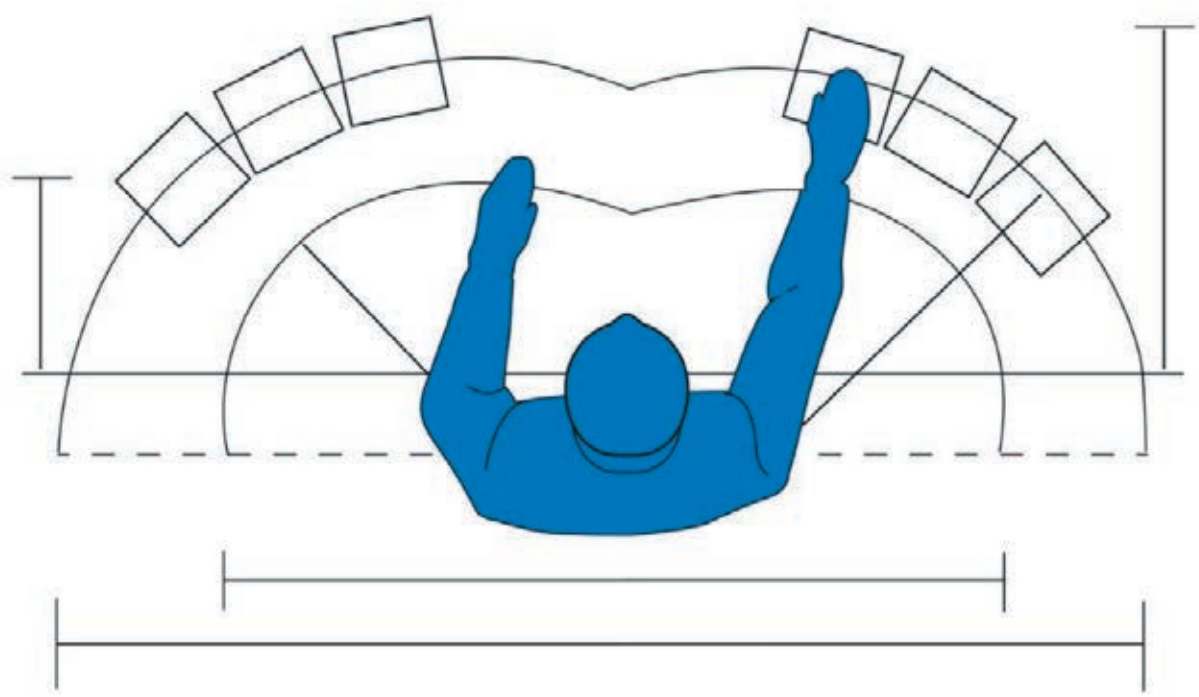

Figure 10

Where more than one person uses a workstation, efforts should be made to allow the height of the work table to be easily adjusted to take account of each individual's stature.

It is always important to provide clear, well-maintained floor space with room for access and egress with or without handling equipment.

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HOW SHOULD ERGONOMIC RISK BE MANAGED?

Current medical and scientific evidence highlights the importance of an ergonomic approach to avoid or reduce the risk of musculoskeletal injury. The ergonomic approach, if carried out effectively, involves a proper study of the nature of a work task and the activities completed by the individual during that task and the collection of key information related to the work task. This approach will determine whether there are ergonomic risk factors present.

In order to be confident that work activities have been designed and planned to minimise the risk of injury, it is essential that ergonomic risk factors are identified and managed through the risk assessment process. Appropriate risk assessment tools assess the work task, identify the risks and devise appropriate interventions to avoid or reduce the risk of injury. This section explains how to manage ergonomic risk through the risk assessment process.

As outlined above, it is a legal requirement to manage ergonomic risks in the workplace. Managing ergonomic risks in this context means management are actively:

- committing to address ergonomic risk and providing the required resources,
- ensuring those responsible for purchasing equipment and designing workplaces understand the importance of integrating ergonomics from the beginning of a project,
- taking steps to understand the nature of work activities carried out in the workplace,
- ensuring the development of competencies in managing ergonomic risk when assessing work activities and the use of appropriate risk assessment tools (see below) in order to quantify ergonomic risk,
- developing innovative engineering or organisational interventions to manage ergonomic risk,
- communicating and consulting with employees at all stages of the process,
- implementing appropriate changes in work practices, and
- providing relevant training and development such as training in the use of new equipment and training on basic ergonomic principles.

Figure 11

HOW SHOULD ERGONOMIC RISK BE MANAGED? cont'd

The risk assessment process

The risk assessment process is central to effective ergonomic risk management. This guide focuses on the revised five-step risk assessment process to manage unfavourable ergonomic conditions when carrying out manual handling tasks or highly repetitive tasks of the upper limbs. Further guidance on the display screen equipment regulations and the risk assessment requirements for work at computer workstations is available from the Health and Safety Authority.[1]

The revised five-step model allows for greater detail under step 3 of the risk assessment process in relation to identifying ergonomic risks and quantifying the level of risk. For example, in the past a risk factor for a manual handling task may have been identified as 'load is too heavy'; now, with the use of a risk assessment tool such as the UK Health and Safety Executive's Manual handling assessment charts, the risk can be identified in more detail: 'load is too heavy as it weighs 50kg and this results in a high level of risk as it may expose a significant proportion of the working population to a risk of injury'. This revision has introduced more factual and evidence-based data.

The UK Health and Safety Executive (HSE UK) has three relevant risk assessment tools that may be used:

- Manual handling assessment charts (the MAC tool)
- Risk assessment of pushing and pulling (RAPP) tool
- Assessment of repetitive tasks of the upper limbs (the ART tool)

People who carry out assessments (assessors) need to be familiar with the operations in question and have competency in using the relevant risk assessment tools (i.e. the MAC, RAPP or ART tools). This guide does not describe how to use these tools so it is important that assessors receive appropriate training. A system of verification should be in place to ensure that assessors have the relevant training and that their assessments are carried out properly. It may be necessary to call in outside expertise in some situations.

Employees should be involved in any risk assessment process and redesign of the system of work.

HSE UK Manual handling assessment charts (MAC)

The MAC tool[2] is designed to assess the most common ergonomic risk factors in lifting, carrying and team handling operations. It is important to read the assessment guide before completing an assessment and to follow the guide and flow chart to determine the level of risk for each ergonomic risk factor (load weight/ frequency, hand distance from lower back, vertical lift region, etc.). Once you have identified the level of risk for each ergonomic risk factor, you should enter the colour band and corresponding numerical score on the score sheet. Figure 12 is an example of a MAC tool score sheet.

[1] See www.hsa.ie/eng/Workplace_Health/Manual_Handling_Display_Screen_Equipment/Guidance_Documents/Display_Screen_Equipment/.

[2] See www.hse.gov.uk/pubns/indg383.pdf.

HOW SHOULD ERGONOMIC RISK BE MANAGED? cont'd

Figure 12

Insert the colour band and numerical score for each of the risk factors in the appropriate boxes below, with reference to your assessment using the tool

Risk Factors	Colour Band (G,A,R or P)			Numerical Score		
	Lift	Carry	Team	Lift	Carry	Team
Load weight and lift/carry frequency	P			10		
Hand distance form the lower back	R			6		
Vertical lift region	G			0		
Trunk twisting / sideways bending Asymmetrical trunk / load carrying	R			2		
Postural constraints	A			1		
Grip on load	R			2		
Floor surface	G			0		
Other environment factors	G			0		
Carry distance (carrying only)						
Obstacles en route (carrying on)						
Communication and co-ordination (team handling only)						
Other risk factors e.g. individual factors, psychosocial factor, etc.	TOTAL SCORE:			21		

The colour bands identify which elements of the task require attention: those with a red or purple colour band have a high or very high level of risk. The total numerical score helps to prioritise those tasks that need most urgent attention and to check the effectiveness of any improvements put in place.

The MAC tool can be used only when you have a full understanding of the task requirements and you have collected all relevant technical information needed to make an informed judgement using the tool.

The MAC tool scoresheet includes a section to note other risk factors that may be evident, including psychosocial risk factors such as:

- little control over how the work is done,
- monotonous work,
- high levels of attention and concentration required,
- frequent tight deadlines, and
- lack of support from supervisors or co-employees.

Any identified psychosocial risk factors should be referred to management at an organisational level.

HOW SHOULD ERGONOMIC RISK BE MANAGED? cont'd

HSE UK Risk assessment of pushing and pulling (RAPP)

The RAPP tool follows a similar approach to the MAC tool and is designed to assess the most common ergonomic risk factors in pushing and pulling operations such as moving loads on wheeled equipment and moving loads without wheels. For each type of operation there is a flow chart, an assessment guide and a score sheet. The flow charts provide an overview of the ergonomic risk factors and assessment process. The assessment guides provide information to help you determine the level of risk for each ergonomic risk factor.

HSE Assessment of repetitive tasks (ART) of the upper limbs

The ART tool is designed to assess repetitive tasks that involve a sequence of upper limb actions of short duration that are repeated over and over again (such as cutting pieces of meat or packing products in a box). Such tasks are typically part of assembly, production, packaging and packing activities. The ART tool follows the same approach as the MAC and RAPP tools and has the same features: the flow chart, the assessment guide and the score sheet.

Five-step risk assessment model

Below is a summary of the revised five-step risk assessment model for managing ergonomic risks that relate to manual handling tasks and highly repetitive tasks of the upper limbs.

Step 1	Task description	Spend time observing the task and consulting with those who do the task. Collect information on how the task is carried out. Take a video recording of the task and/or photographs of different stages of the task to gather important visual information, such as the posture of the worker when handling a load. Consult with the people performing the task to explain what you are doing and ensure that they are all right with it before you begin to video or photograph them. Identify the key stages of the task. Note: A useful tip is to review the criteria in the risk assessment tool that you plan to use for step 3 of the risk assessment in order to identify the key information you will need when using the tool. For example, if you are observing a manual handling lifting task and you are going to use the MAC tool, you will need to know: • Load weight • Frequency of lifting • Hand distance from lower back • Vertical lift • Trunk twist/sideways bending • Postural constraints, grip on the load, floor surface and other environmental factors

[3] See www.hse.gov.uk/pubns/indg478.pdf.

HOW SHOULD ERGONOMIC RISK BE MANAGED? cont'd

Step 2	Collect technical information	Use a measuring tape to take all relevant physical measurements, including details of the load being handled and the work environment (e.g. height of work table, distance from floor to the top of a pallet). Use weighing scales to determine the actual weight of the load. Collect other relevant information to allow you to use the appropriate risk assessment tool. Review video recordings and photographs of the task and record information on the postures observed during the handling activity.
Step 3	Identify the risk factors using the relevant risk assessment tool and fill in the relevant score sheet information	Use the relevant risk assessment tool (i.e. MAC tool, ART tool or RAPP tool). Using the technical data and images already collected, complete the tool's score sheet. The assessor must provide information to support the score given for each of the criteria. For example: 'The load is too heavy as it weighs 50kg and this results in a high level of risk.' The score sheet will indicate the level of risk for each of the criteria and this information will identify whether there are any high-risk ergonomic issues to be addressed.
Step 4	Identify the improvements to be put in place	The employer has a duty to put appropriate measures in place to avoid or reduce the risk of injury. Appropriate measures will address the risk factors in a practical and effective manner. Appropriate measures include the introduction of mechanical aids or revised systems to eliminate the need to manually lift heavy loads. Such changes require consultation with all affected parties and an objective review of the information collected. The improvements put in place should avoid or reduce the risk of injury. They may be a combination of: • use of mechanical aids for all or part of the activity, • Reorganisation of work area or materials, • development of a safe system of work plan, method statement or standard operating procedure, and • training for those who carry out the task, which may include instruction on how to use a new piece of handling equipment or new systems for storing or positioning product.

HOW SHOULD ERGONOMIC RISK BE MANAGED? cont'd

Step 5	Review the effectiveness of the improvements made	Carry out a review to ensure that the recommended improvements have been implemented and that they have addressed the identified risk factors. The assessor may decide to use the relevant risk assessment tool again to score the task and to determine if the scores for the different criteria have resulted in a sufficiently low level of risk.

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HOW SHOULD ERGONOMIC RISK BE MANAGED? cont'd

Below is a worked example of the risk assessment process.

<table>
<tr><td>Step 1</td><td>Task description</td><td>The metal billets have to be transferred manually from a table into a CNC machine. The employee takes the billet from the table and carries it to the machine and then reaches in to place the billet in position in the machine.
   </td></tr>
<tr><td>Step 2</td><td>Collect technical information</td><td>As this is a manual handling task, the appropriate risk assessment tool to use is the MAC tool.

There are changes in posture as the billet is transferred from the table to the CNC. The billet can weigh 20–130kg. The table is at waist height. The floor is clean and free of debris. There are no handles on the load and it is difficult to carry.</td></tr>
<tr><td>Step 3</td><td>Identify the risk factors using the relevant risk assessment tool and fill in the relevant score sheet</td><td>Complete the MAC tool score sheet for this task:
Insert the colour band and numerical score for each of the risk factors in the appropriate boxes below, with reference to your assessment using the tool
<table>
<tr><th rowspan="2">Risk Factors</th><th colspan="3">Colour Band (G,A,R or P)</th><th colspan="3">Numerical Score</th></tr>
<tr><th>Lift</th><th>Carry</th><th>Team</th><th>Lift</th><th>Carry</th><th>Team</th></tr>
<tr><td>Load weight and lift/carry frequency</td><td>P</td><td></td><td></td><td>10</td><td></td><td></td></tr>
<tr><td>Hand distance form the lower back</td><td>R</td><td></td><td></td><td>6</td><td></td><td></td></tr>
<tr><td>Vertical lift region</td><td>G</td><td></td><td></td><td>0</td><td></td><td></td></tr>
<tr><td>Trunk twisting / sideways bending Asymmetrical trunk / load carrying</td><td>R</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td>Postural constraints</td><td>A</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td>Grip on load</td><td>R</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td>Floor surface</td><td>G</td><td></td><td></td><td>0</td><td></td><td></td></tr>
<tr><td>Other environment factors</td><td>G</td><td></td><td></td><td>0</td><td></td><td></td></tr>
<tr><td>Carry distance (carrying only)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Obstacles en route (carrying on)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Communication and co-ordination (team handling only)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Other risk factors e.g. individual factors, psychosocial factor, etc.</td><td colspan="3">TOTAL SCORE:</td><td>21</td><td></td><td></td></tr>
</table>
There are a number of ergonomic risk factors with respect to this handling task. These include the load weight (billet weight up to 130kg), hand distance from the lower back (upper arms angled away from the body and trunk), trunk twisting and sideways bending when placing the billet into the CNC machine, and grip on load.</td></tr>
</table>

HOW SHOULD ERGONOMIC RISK BE MANAGED? cont'd

Step 4	Identify the improvements to be put in place	High-risk and very high-risk ergonomic risk factors were identified in step 3. As a result, the employer consulted with the person who does the job and a number of other colleagues to identify an appropriate solution to avoid the handling of the billets. A custom-engineered billet loader was fixed to the floor at each CNC machine centre and all operators were trained to use it. 
Step 5	Review the effectiveness of the improvements made	The new engineering intervention is very effective in that it has eliminated the ergonomic risk factors completely. The billet loader eliminates the manual lifting of the billet and can be operated with a neutral standing posture.

The above example involved use of the MAC tool for the risk assessment of a manual handling task. The risk assessment tool that you use will depend on the work activity being assessed. If you need to assess a work task that involves high repetition movements of the upper limbs, then it is appropriate to use the ART tool. If you need to assess a work task that involves a lot of pushing and pulling of trolleys or pallets, then the appropriate tool to use is the RAPP tool. The assessor must have undergone appropriate training prior to using any of these risk assessment tools.

When introducing a change in work practice to address ergonomic risk factors, it is important that the information is communicated to all relevant staff. Below are a number of actions that need to be taken:

- Implement the appropriate task-specific control(s) to clearly address the ergonomic risk factors identified in the assessment tool score sheet
- Develop a safe system of work plan (SSWP) or a method statement as a useful way of demonstrating and documenting the interventions that have been put in place
- Provide appropriate training so that workers understand what changes have been put in place, how the changes will address ergonomic risk and how they should carry out the task using the appropriate equipment provided or in line with the relevant SSWP or method statement
- Ensure that the introduction of a new control measure to address ergonomic risk does not introduce any new risks

CONCLUSION

The five-step risk assessment case study featured in this guide illustrates the ergonomic approach to assessing and controlling ergonomic risks in the workplace. It makes good business sense to address ergonomic risks in this manner and evidence has shown that a proactive and systematic ergonomic approach will provide a work environment where people can develop new skill sets, including communication, critical thinking, creative thinking, problem solving, brainstorming, technical and influencing skills. These skills are very important in managing ergonomic risk effectively but can also be applied to other aspects of the business.

Historically there has been an overdependence on training in manual handling safe-lifting techniques as the cure-all for musculoskeletal injury and illness reduction. However, evidence-based research is clear that the ergonomic approach is essential for effective ergonomic risk management in that it advocates a careful examination of the nature of work tasks, it improves the knowledge and understanding of ergonomic risk and risk assessment and it focuses attention on the introduction of appropriate engineering and organisational interventions.

This guide has given direction on the actions that need to be taken in order to manage ergonomic risks at workplace level, explained the main ergonomic risk factors that may impact a person's health when carrying out a physical work task and outlined the risk assessment process involved in managing ergonomic risks. Further information may be accessed through the resources listed at the end of this guide. Future work will include the development of an ergonomic risk management audit tool to be used to carry out a systematic process of investigation to gather evidence and to evaluate the extent to which ergonomic risk is being managed effectively in a workplace setting.

[4] The HSA's Ergonomics Good Practice in the Irish Workplace gives examples to illustrate this skill set development.
See: www.hsa.ie/eng/Publications_and_Forms/Publications/Manual_Handling_and_Musculoskeletal_Disorders/Ergonomics_Good_Practice.pdf.

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RESOURCES

Health and Safety Authority

Publications available at www.hsa.ie

- *Ergonomics good practice in the Irish workplace*, 2015
- *Guidance on prevention and management of musculoskeletal disorders in the workplace*, 2013
- *Guide on the prevention of upper limb disorders (ULDs) in the financial services sector*, 2012
- *Management of manual handling in healthcare,* 2011
- *Manual handling risk assessment in the hospitality sector,* 2009
- *Manual handling risk assessment in the retail sector*, 2010

Videos available at www.hsa.ie

- Manual handling video series 1
- Manual handling video series 2

Further information on MSDs and sector-specific guidance can also be found at www.hsa.ie

Health and Safety Executive for Northern Ireland

Videos available at www.hseni.gov.uk

- Manual handling videos

Health and Safety Executive UK

Publications available at www.hse.gov.uk

- *Manual handling assessment charts (the MAC tool)*
- *Assessment of repetitive tasks of the upper limbs (the ART tool)*
- *Risk assessment of pushing and pulling (RAPP) tool*

Further information on MSDs and sector-specific guidance can also be found at www.hse.gov.uk

Further Information and Guidance:

Visit our website at **www.hsa.ie**, telephone our contact centre on **0818 289 389** or email **wcu@hsa.ie**

Use BeSMART, our free online risk assessment tool at **www.besmart.ie**

Check out our range of free online courses at **www.hsalearning.ie**

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