

Towards an Integrated Prevention Strategy for **MANUAL HANDLING**

DS-1088

Awareness document on the prevention
of musculoskeletal disorders (MSDs)
related to manual handling tasks



Institut de recherche
Robert-Sauvé en santé
et en sécurité du travail

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Sources

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Comments

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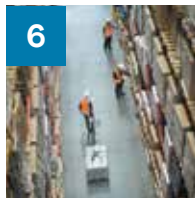
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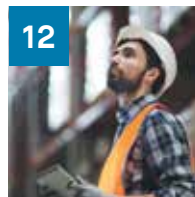
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How do you pick up an object at point A and move it to point B while respecting production demands and safeguarding your health and safety?



Handling Poses a Challenge in the Prevention of Musculoskeletal Disorders

From order pickers to garbage collectors, from hospital staff to movers, workers in many sectors perform handling tasks every day. Professional handlers are thus not the only workers who do this type of work.

The constraints, variability and unpredictability that characterize handling situations constitute major challenges for all these workers and often lead to musculoskeletal disorders (MSDs).

Over the 2013–2017 period, 56% of the MSDs compensated by the CNESST were related to handling. The human, social and financial consequences of these injuries are significant, for both employers and workers. For example, a single MSD related to handling results in an average of 88 days of absence from work.¹

Training in safe techniques is a popular prevention measure in workplaces. However, studies demonstrate that this type of training has limited effects because it does not sufficiently take into account the complexity of handling tasks and the skills that workers must develop to meet the challenges they face.

In order to prevent occupational injuries, it is essential to consider the conditions under which handling tasks are carried out, because they determine to what degree workers are able to apply their skills in their workplaces.

¹ Boucher, A. (2019). *Données sur les lésions professionnelles acceptées qui sont des TMS reliés à la manutention, Québec, 2013 à 2017, of Statistical Knowledge and Surveillance Group, IRSST Scientific Division*. Montréal, QC: IRSST. Unpublished data.

The IRSST's Work in Preventing Handling-related MSDs

For many years, the IRSST has invested in numerous research projects related to handling, including risk analysis, work organization, documentation of know-how and training, in addition to the development of a new approach to prevention. Combining ergonomics and biomechanics, these studies have focused on the variety of methods used by both novice and expert handlers. They have been used to explore and validate some of the action principles of safe and efficient manual handling. The Integrated Prevention Strategy for Manual Handling (IPSMH) incorporates features specific to workers and the unique characteristics of their work. OHS professionals received training in the use of the IPSMH and most of them were able to appropriate and transfer it into their regular intervention practices. They seem to appreciate this approach because they see it as a promising avenue for preventing injuries.



Handling Is a Complex Task

At first glance, handling looks like a simple task, in which one picks up an object at point A and moves it to point B.

However, this work activity is more complex than it appears because there are two aspects that can be challenging:

- Handling situations are variable
- Handling tasks are demanding



To adapt to changing work conditions, while taking into account the variability of their own situations, workers must constantly rethink how they do things.



Handling Situations Are Variable

In the same work setting, handling situations can often change. Simple and monotonous handling tasks are generally automated. Those that are assigned to workers are more complex and require handling a variety of loads (in terms of weight, volume and shape, etc.) in diverse contexts (such as variable heights for picking up and putting down objects, space constraints).

Thus, a single work shift may involve many different handling situations with more or less predictable characteristics.



Handling Tasks Are Demanding

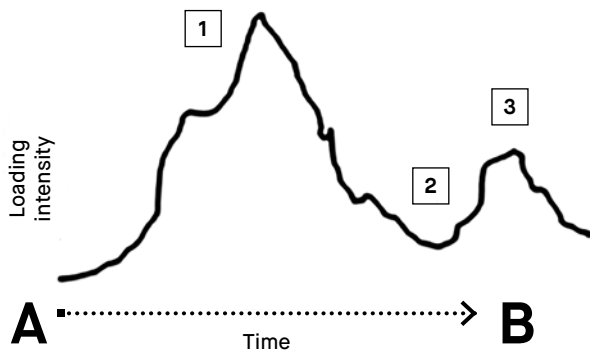
When workers lift and move an object, the effort exerted results in loading (compression force and moment), especially of their backs.

This effort is produced both by the upper and lower body, which play distinct but complementary roles.

- 1 Upper body**
Lifting and holding a load requires muscular effort to counterbalance the weight of the object that is pulling the body forward. The mass of the load and how far it is from the worker's lower back determine the amount of loading on that part of the body.
- 2 Lower body**
The lower body ensures the stabilization and movement of the load to where it will be deposited. The degree of stability affects sudden effort, such as that caused by a loss of balance or control of the load.



Effort exerted and loading of the back vary over three major phases of handling.



Handling phases

- 1 Pick up**
 Grasping and lifting the load. Creation of the “worker-load tandem.” The first instant in which the load is completely supported by the worker, and the phase in which there is maximum effort.
- 2 Movement**
 Transferring or transporting the load. The distance over which the load is moved influences the amount of effort that will be deployed when the load is completely supported by worker.
- 3 Deposit**
 Setting down the load. The amount of effort required will depend on the characteristics of the location where the object is put down (confined space, height, etc.).



Types of effort involved in handling

In addition to being diverse, demands vary according to the type of handling, the work context and unforeseen circumstances. They are therefore not the same from one situation to another and may occur simultaneously.

When the demands exceed workers' physical capacities, there is a risk of overload and/or fatigue, which can cause an injury.

The demands that are most likely to cause injuries have been grouped into four categories according to the type of effort involved in the task.



1 Excessive effort

Too much exertion, usually in the early stages of lifting a load. It results from the weight and position of the object being lifted in relation to the handler.

2 Sudden effort

An unexpected effort, often due to losing one's balance or control of the load. This type of effort can lead to a fall and injuries.

3 Asymmetrical effort

An effort that is unevenly distributed over the body. Twisting of the spine is the most common asymmetrical effort. Workers make this type of effort when carrying a load on only one side of the body.

4 Cumulative efforts

The accumulation of effort over time. It could be from repetitively carrying out the same handling effort or from supporting a load for too long. In these cases, the nature of the route to be taken becomes very important, particularly with regard to distance or variations in the surface being travelled over. Going up and down stairs is a typical kind of cumulative effort that can increase the risk of accidents or injuries.



Handling Work Takes Skill

The variability and presence of different risks, often occurring simultaneously, make it necessary to be skilled in handling.

It is possible for most workers to carry out handling tasks in their workplace without training. However, few of them can balance both performance and health and safety objectives. Studies of expert handlers in action have shown that handling tasks require the development of three skills, which constitute the steps of a decision-making process:

- **Gathering the relevant information in a working situation**
- **Choosing a way of doing things to find the best compromise**
- **Planning the work**

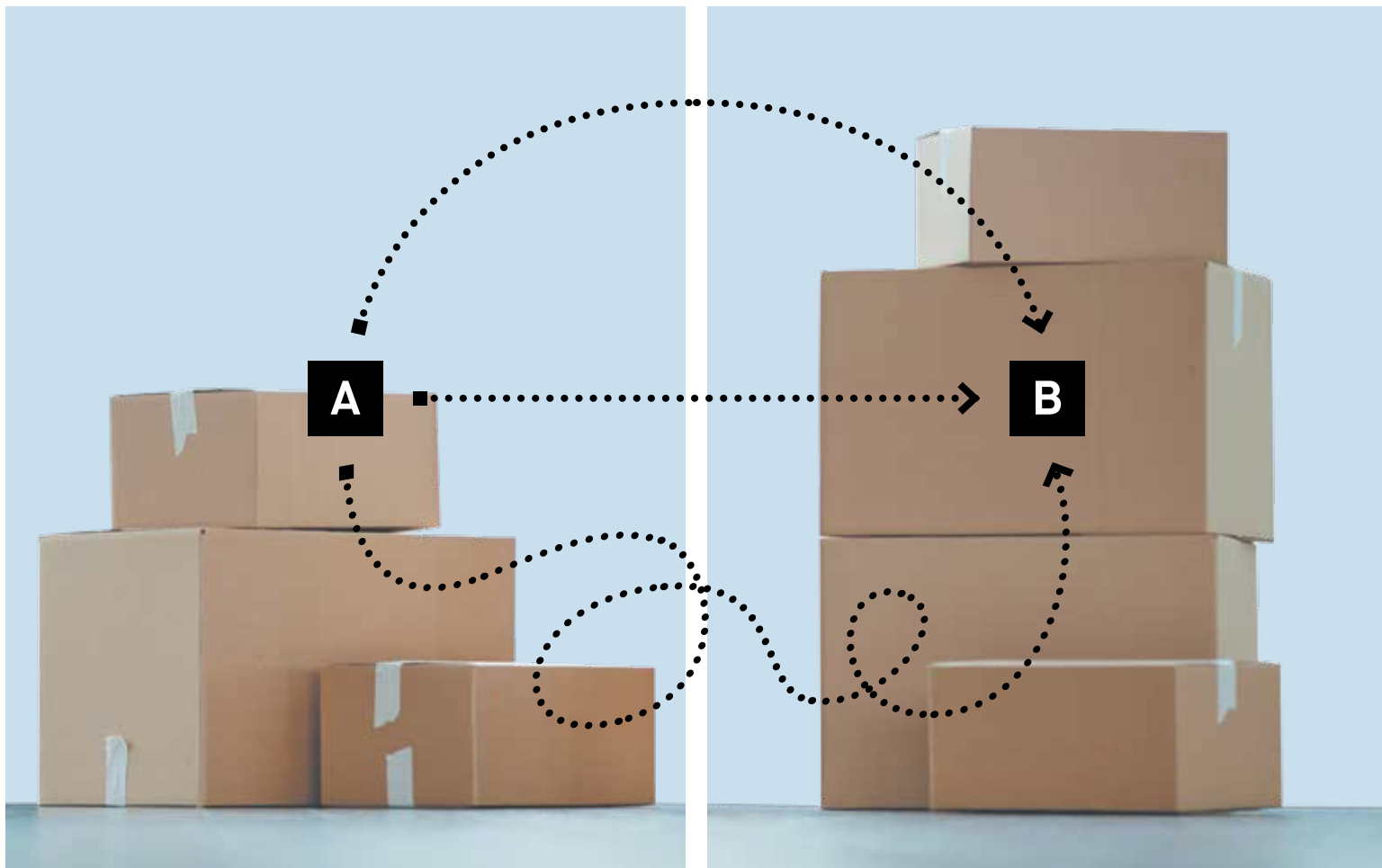


Gathering the Relevant Information in a Work Situation

Gathering information about the load to be moved and where the handling activity will take place is essential. Observing, touching, sliding or tilting the load will give the worker the information required to assess the potential risks and possibilities for action in a given situation.

Workers can use the following indicators to choose the most appropriate approach for each situation:

- 1 Load**
 Weight / Volume and shape / Fragility and instability / Possibilities of getting a firm grip / Position of the centre of gravity
- 2 Environment**
 Space for the feet / Uneven ground / Slippery surface / Clutter
- 3 Layout**
 Position of the object when it is lifted (height, distance, possibility of moving closer to the load, easy or restrictive access) / Confined space when depositing the load / Pick-up location in relation to deposit location (horizontal and vertical distance, presence of obstacles)



Choosing a Way of Doing Things to Reach the Best Compromise

The study of expert handlers in action shows that they seek to achieve a good production level while avoiding exhaustion and injury. They therefore have two distinct objectives, which they must reconcile.

Being productive and satisfied with one's work

Meeting production demands and having a sense of a job well done.

Safeguarding health and safety

Reducing the risk of injury, maintaining an acceptable level of fatigue and comfort and improving one's flexibility and speed to adapt to situations.²

To accomplish this, these workers choose the most appropriate technique according to the handling situation that they had assessed beforehand and by taking their condition into consideration. They then establish strategies to reduce the weight-bearing phase, i.e., the intensity and duration of loading.

Nevertheless, because risks are not the same from one situation to another and can exist simultaneously, the method chosen is often a compromise among the various objectives of safeguarding health and safety. Ways of doing things thus vary from one handling situation to another, leading to the use of a wide range of techniques to minimize the risk or risks that the workers feel are most significant.

² Lortie, M. (2002). Manutention : prise d'information et décision d'action. *Le travail humain*, 65(3), p. 196.



Planning the Work

This more general skill refers to the ability of workers to plan their work, set priorities and organize their handling tasks to enhance their efficiency throughout the day and/or week. Optimal planning helps workers economize their efforts and to spend less time working against the clock, which can increase the risk of accidents.

How this skill is put into practice is very specific to the environment in which handling takes place, because it depends on the working conditions. Despite the diversity of work organization methods, the research made it possible to identify five rules that guide how handling tasks should be planned.

“Unnecessary” handling/re-handling

Ideally, a load should only be handled once. “Unnecessary” handling requires extra effort.

Time allotted

The time allotted for a task should be sufficient to avoid having to rush, especially in unforeseen circumstances.

Work pace

A synchronized work pace (regular and constant) facilitates efficiency.

Movement and route

The optimal route is not necessarily the shortest. It is best to choose the route that requires both the least energy and the least time.

Distribution of effort

A good distribution of effort and breaks during a work shift gives the body time to recover.



Combining Training and Intervention: A Strategy for Preventing Handling-related MSDs

The challenge for workers who do handling work depends less on applying a pre-established technique than on choosing ways of doing things according to the variability of the situation in which they find themselves.

Workers must make decisions to solve the problems posed by handling situations. Studies show that this ability to decode a handling situation and to adapt how they do things accordingly is essential to protect themselves from the risks of injury and to enable them to reach production objectives. Taking into account the conditions under which handling tasks are performed is also crucial for the prevention of occupational injuries, because they determine workers' ability to apply their skills in their workplaces. Two approaches are currently proposed:

- Training in safe techniques
- The Integrated Prevention Strategy for Manual Handling (IPSMH)



The “straight back-knees bent” technique does not take the complexity of handling situations into consideration.

The Limits of Training Programs that Teach Safe Techniques

Training in safe techniques focuses on teaching predefined methods that aim to lessen the risk of excessive effort, above all. These methods do not sufficiently allow for the simultaneous presence of other types of risks, the worker’s objectives and the conditions under which the handling activities take place. For example, the fact that regular use of these techniques can be very energy intensive for workers is undervalued. That is why a number of studies question the effectiveness of this type of training.

It should be part of a more holistic process given that safe techniques are not suitable in all handling contexts.

The Integrated Prevention Strategy for Manual Handling

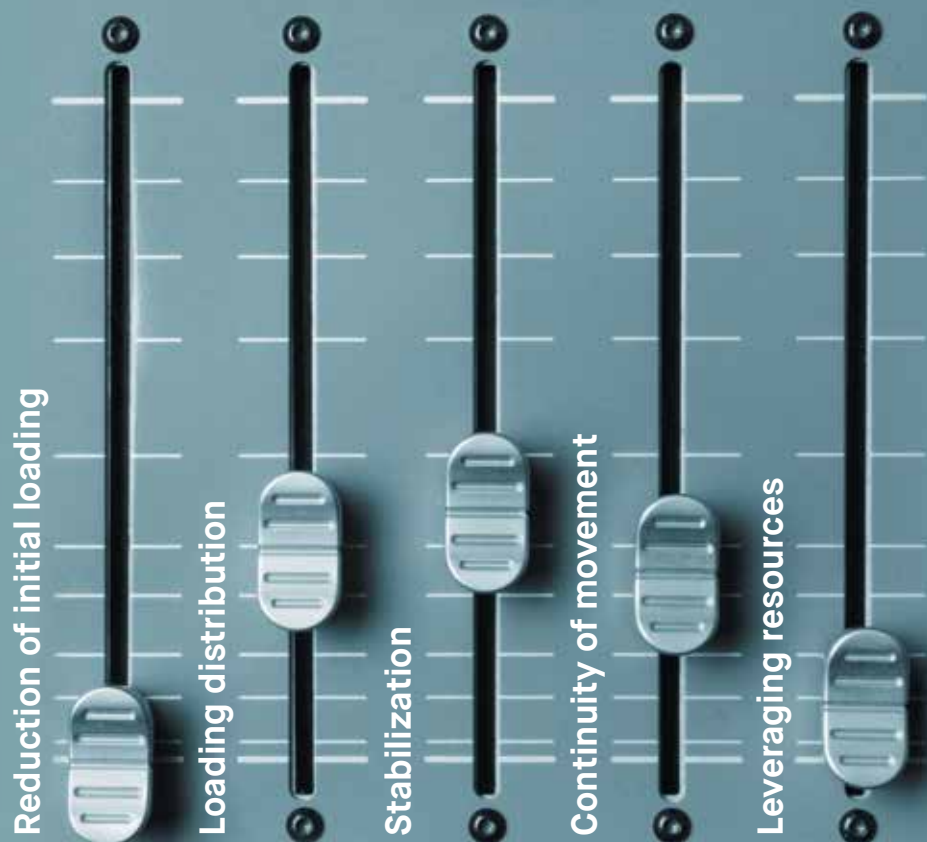
The Integrated Prevention Strategy for Manual Handling (IPSMH) is an approach that combines training and interventions based on the understanding, observation and analysis of five action principles.

These action principles are the features that all the handling techniques used by workers have in common. Each of them has specific indicators of what to focus on. They point to the compromises that workers must make to reach their objective of safeguarding their health and safety, because they are related to demands or to effort.

In this perspective, the action principles serve as a common language between the practitioners and the workers to discuss the underlying aspects that drive how things are done. They make it possible to question the relevance of the techniques used, in addition to the degree to which the working conditions provide the possibility of using the most appropriate method in a given situation. These exchanges can lead to the development of skills through contextualized training and/or an intervention to improve situations that are too demanding.

These five action principles make it possible to better understand the decision-making process that best meets the challenges posed by handling situations.

The action principles are five interdependent parameters that make it possible for workers to adapt their handling techniques to each situation and its demands.



Conclusion

Handling is a complex task that requires workers to develop skills to help prevent MSDs. Training in safe techniques has limits in this regard. For example, this type of training minimizes the influence of working conditions on constraints and workers' ways of doing things.

In fact, the key to preventing handling accidents and injuries lies in understanding the choice of technique. The IPSMH, an approach that melds training and intervention in the workplace, broadens the range of training on offer by presenting a more comprehensive prevention approach.

Joint sector-based associations (JSAs), professionals in regional public health boards and private trainers now offer this type of approach.

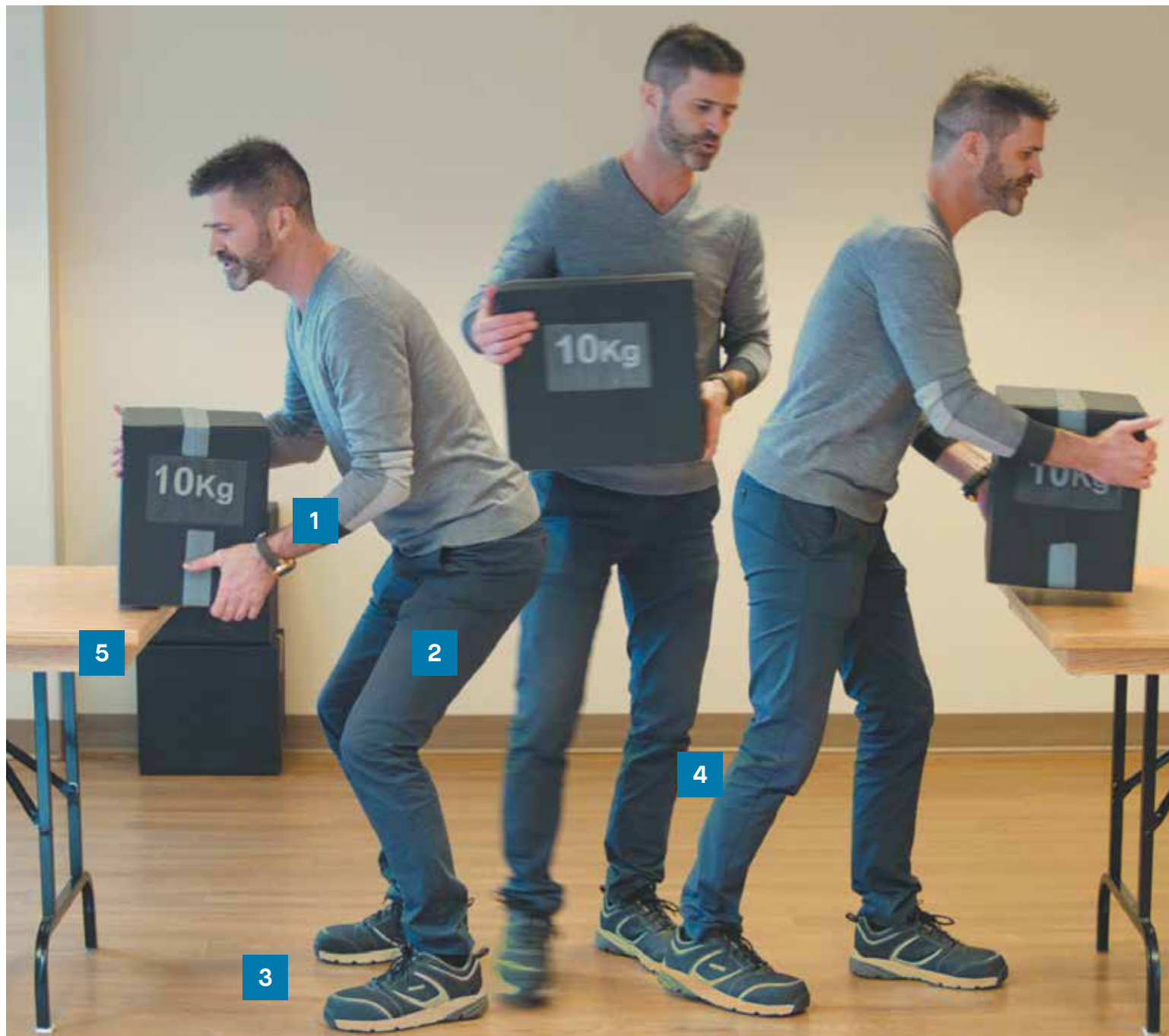


For more information about the studies that led to the development of the Integrated Prevention Strategy for Manual Handling (IPSMH) and to watch videos about the action principles, consult the *Manutention en milieu de travail*. This website is in French only.

manutention.irsst.qc.ca

APPENDIX

Five Action Principles



- 1** Reduction of initial loading
- 2** Loading distribution
- 3** Stabilization of the “worker-load tandem”
- 4** Continuity of movement
- 5** Leveraging resources

PRINCIPLE 1

Reduction of Initial Loading

DESCRIPTION

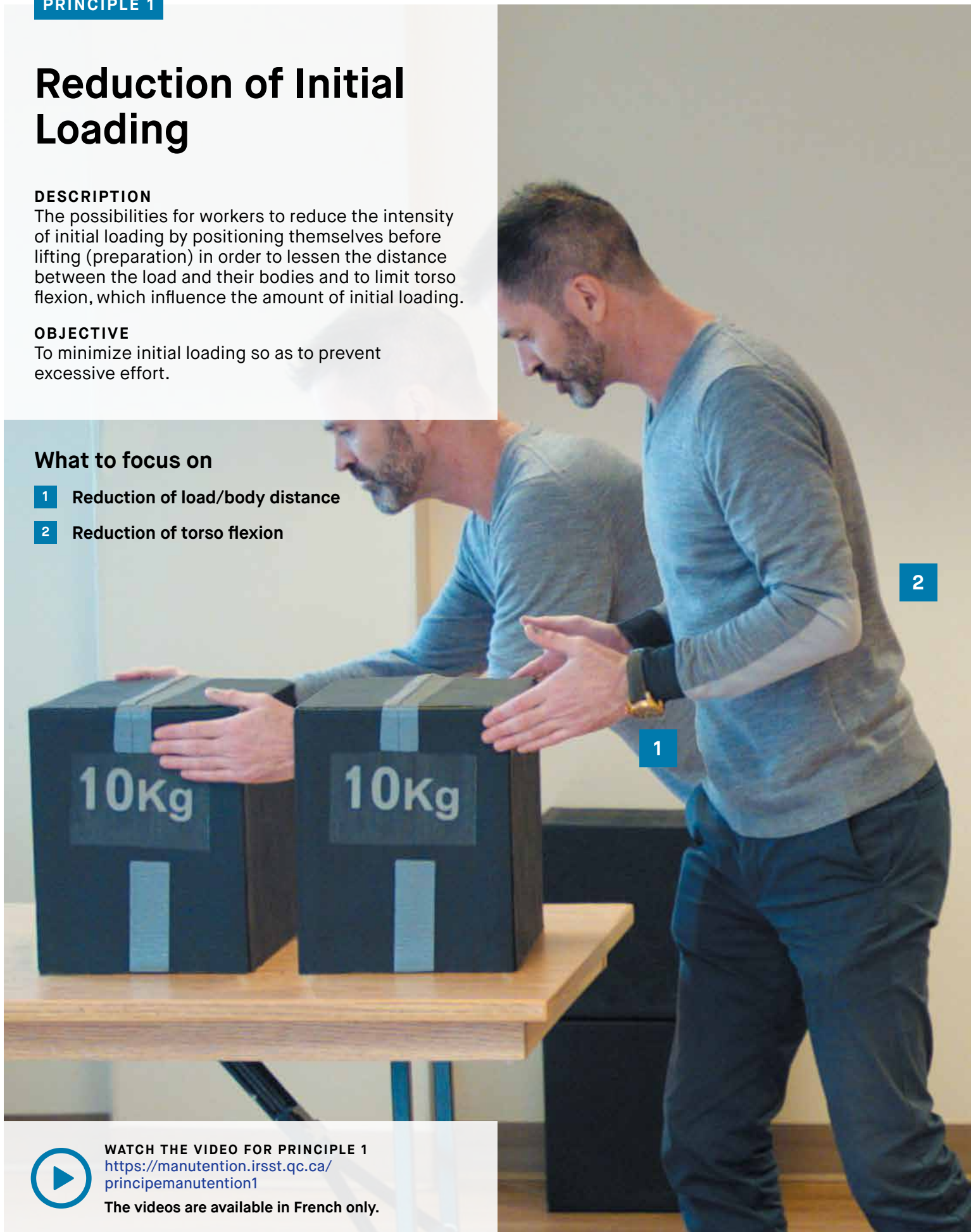
The possibilities for workers to reduce the intensity of initial loading by positioning themselves before lifting (preparation) in order to lessen the distance between the load and their bodies and to limit torso flexion, which influence the amount of initial loading.

OBJECTIVE

To minimize initial loading so as to prevent excessive effort.

What to focus on

- 1 Reduction of load/body distance
- 2 Reduction of torso flexion



WATCH THE VIDEO FOR PRINCIPLE 1
<https://manutention.irsst.qc.ca/principemanutention1>

The videos are available in French only.

PRINCIPLE 2

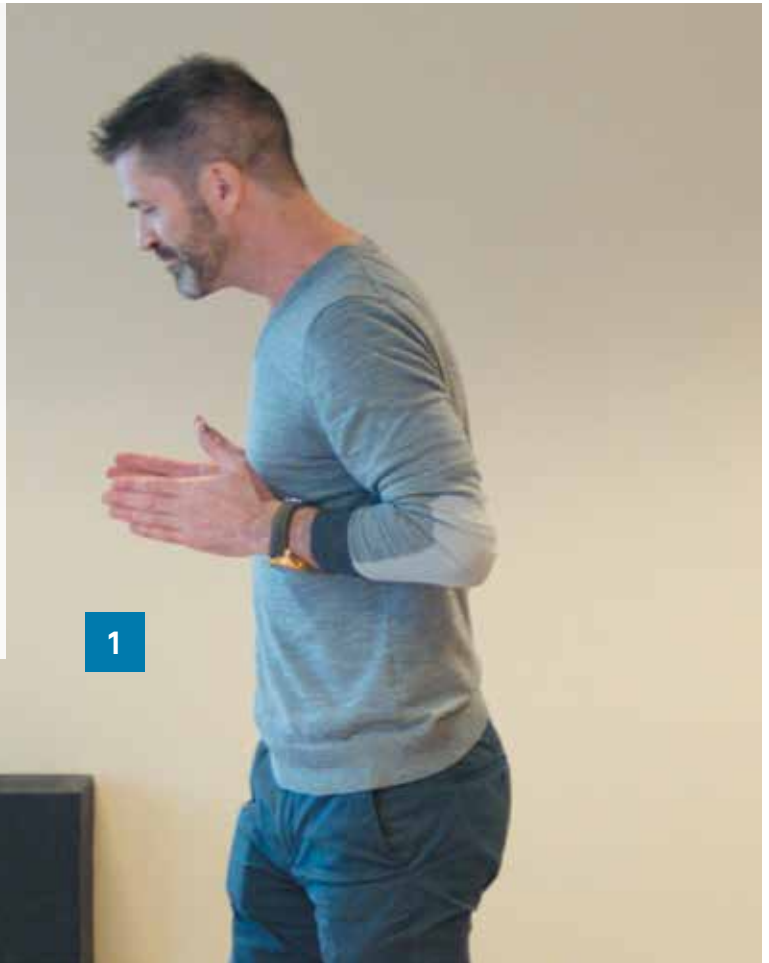
Loading Distribution

DESCRIPTION

Refers to the quality of loading, i.e., how well the weight is distributed over the worker's body. The heavier the load, the more evenly its weight must be distributed so that it is not concentrated in one place.

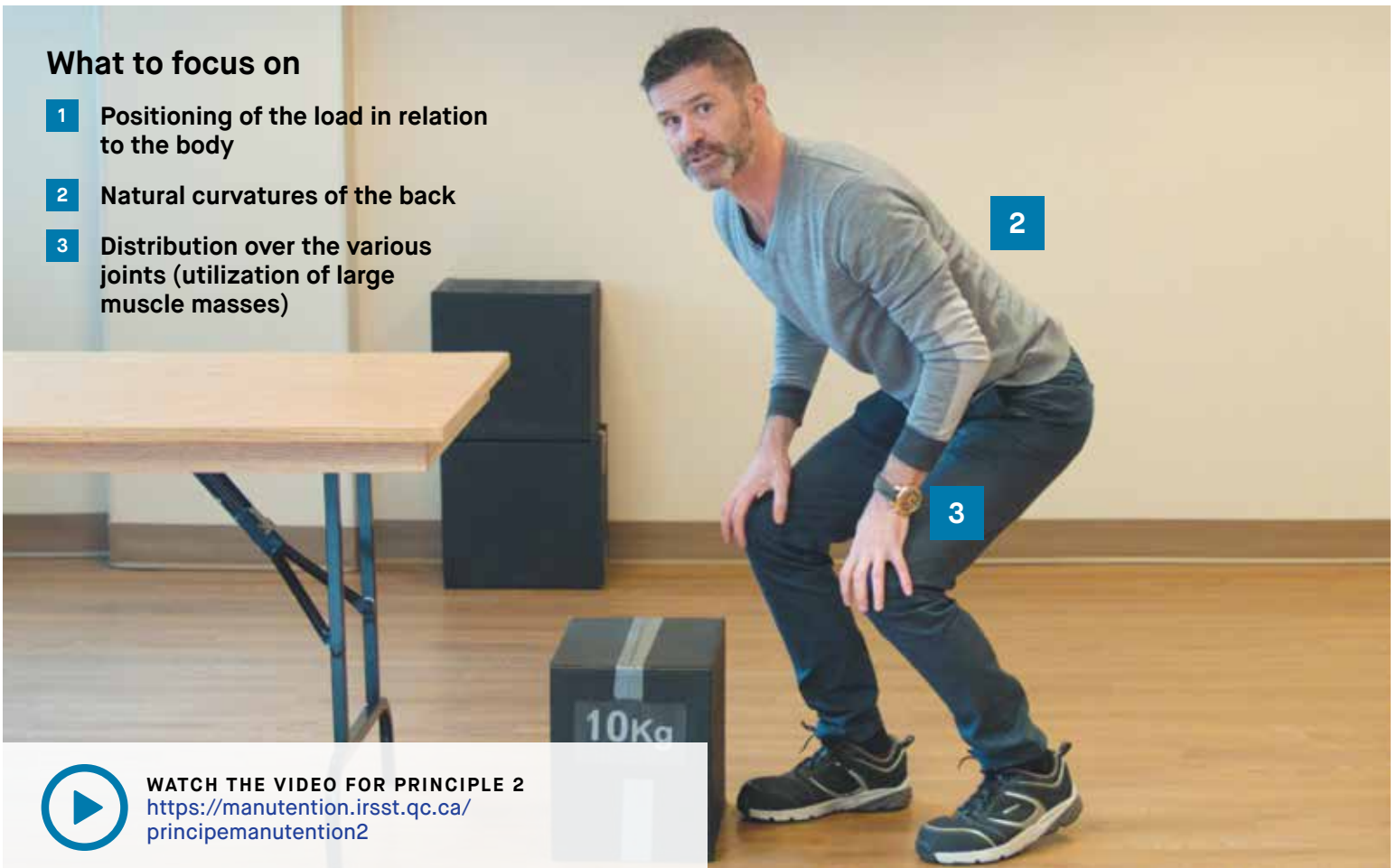
OBJECTIVE

To minimize the risk of asymmetrical efforts that place unequal demands on the body by ensuring that loading occurs as uniformly as possible over the various body structures.



What to focus on

- 1 Positioning of the load in relation to the body
- 2 Natural curvatures of the back
- 3 Distribution over the various joints (utilization of large muscle masses)



WATCH THE VIDEO FOR PRINCIPLE 2
<https://manutention.irsst.qc.ca/principemanutention2>

PRINCIPLE 3

Stabilization of the “Worker-load Tandem”

DESCRIPTION

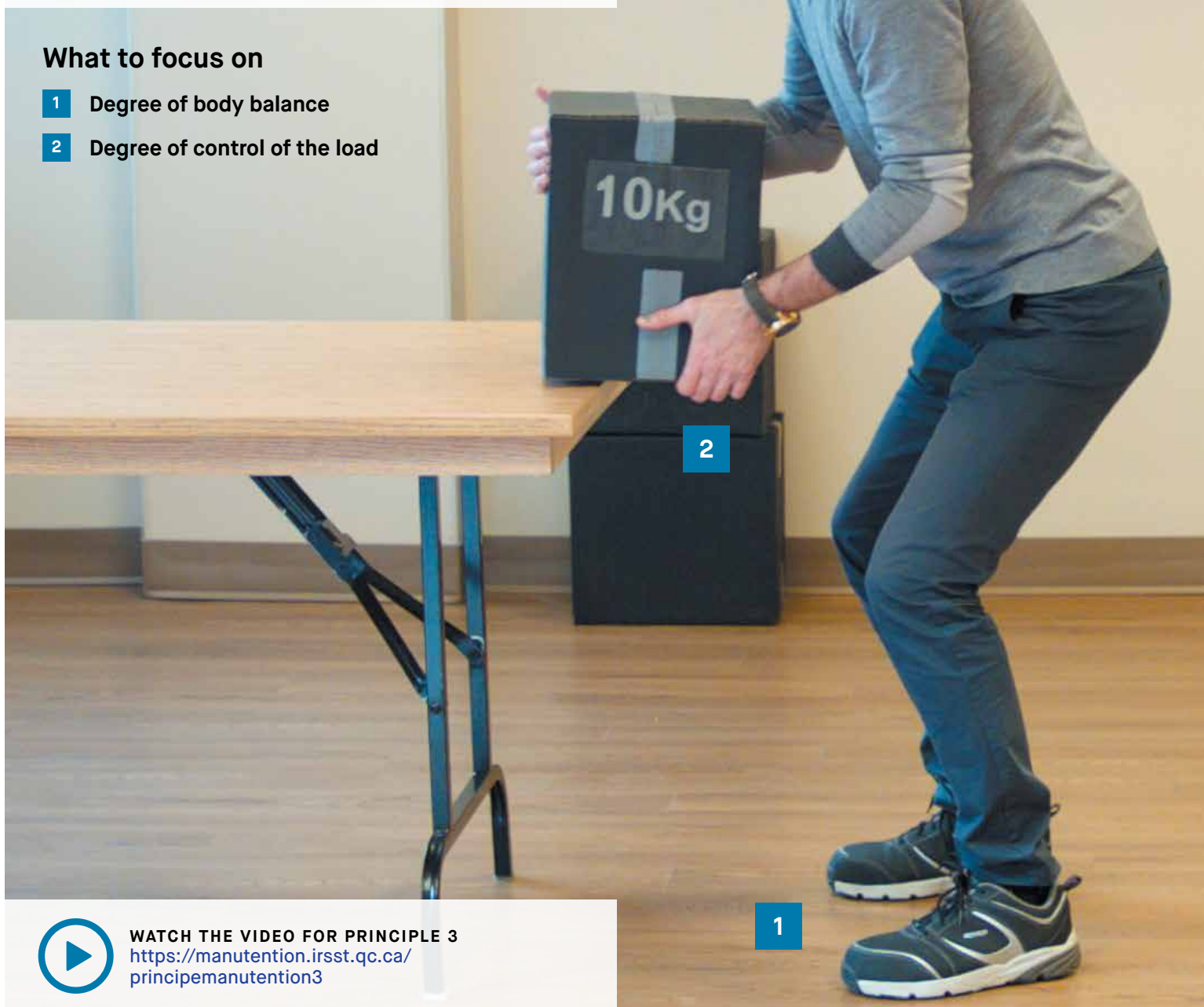
The degree of control of the body and the load needed to support loading. It depends on the amount of loading: the greater it is, the more the tandem must be stable to avoid unpleasant surprises.

OBJECTIVE

To minimize the risks involved in sudden effort by having the level of stability required when loading occurs.

What to focus on

- 1 Degree of body balance
- 2 Degree of control of the load



WATCH THE VIDEO FOR PRINCIPLE 3
<https://manutention.irsst.qc.ca/principemanutention3>

PRINCIPLE 4

1

Continuity of Movement

DESCRIPTION

The degree to which movements are coordinated between the worker's position when picking up the load and moving it towards where it will be deposited.

OBJECTIVE

To reduce cumulative effort by avoiding asymmetrical efforts and jerky movements.

What to focus on

- 1 Transition
- 2 Fluidity of movement

2



WATCH THE VIDEO FOR PRINCIPLE 4
<https://manutention.irsst.qc.ca/principemanutention4>

PRINCIPLE 5

Leveraging Resources

DESCRIPTION

The possibilities for workers to use their bodies, the load, support surfaces and speed of execution to lessen loading.

OBJECTIVE

To minimize the risk of cumulative effort by reducing weight bearing (intensity and duration of loading).



What to focus on

- 1 Speed of execution
- 2 Use of the body
- 3 Use of the load
- 4 Use of support surfaces



WATCH THE VIDEO FOR PRINCIPLE 5
<https://manutention.irsst.qc.ca/principemanutention5>

3



4





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