



## Hand-arm Vibration



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This module will introduce you to the workplace hazard of **hand-arm vibration**, which is the name given to vibration that can affect your hands and lower arms whilst operating vibrating equipment. Too much exposure to hand-arm vibration can lead to a range of permanent, disabling medical conditions which together are known as **hand-arm vibration syndrome**.

The fact that hand-arm vibration can affect your health has been recognised since the start of the 20th century, but much more is now understood about how and why it poses a risk. The seriousness of the risk is such, that your employer has a legal duty to protect you from vibration at work.

The subjects covered in this module include:

- a description of hand-arm vibration;
- a brief discussion of the medical symptoms associated with hand-arm vibration syndrome;
- identification of where hand-arm vibration risks come from;
- a brief discussion of the laws and regulations which apply to hand-arm vibration; and
- a description of what you and your employer can do to protect you against hand-arm vibration syndrome.

This means that upon completion of this module, you should:

- know what hand-arm vibration is;
- be able to identify hand-arm vibration risks;
- have a basic understanding of hand-arm vibration syndrome and know what symptoms to look for;
- know the legal limits for your exposure to hand-arm vibration;
- understand the actions your employer must take to protect you against hand-arm vibration syndrome; and
- know what measures you can take to minimise your exposure to hand-arm vibration risks.

If, having completed this module, you have any queries or concerns regarding hand-arm vibration, or any other aspect of workplace safety (particularly with respect to carrying out your own work), then you should raise these with your supervisor, employer or company safety officer as soon as possible.

## What is Hand-arm Vibration?

**Hand-arm vibration (HAV)** is a form of vibration that is transmitted into your hands and arms, usually as a result of carrying out mechanised, hand-held work tasks.

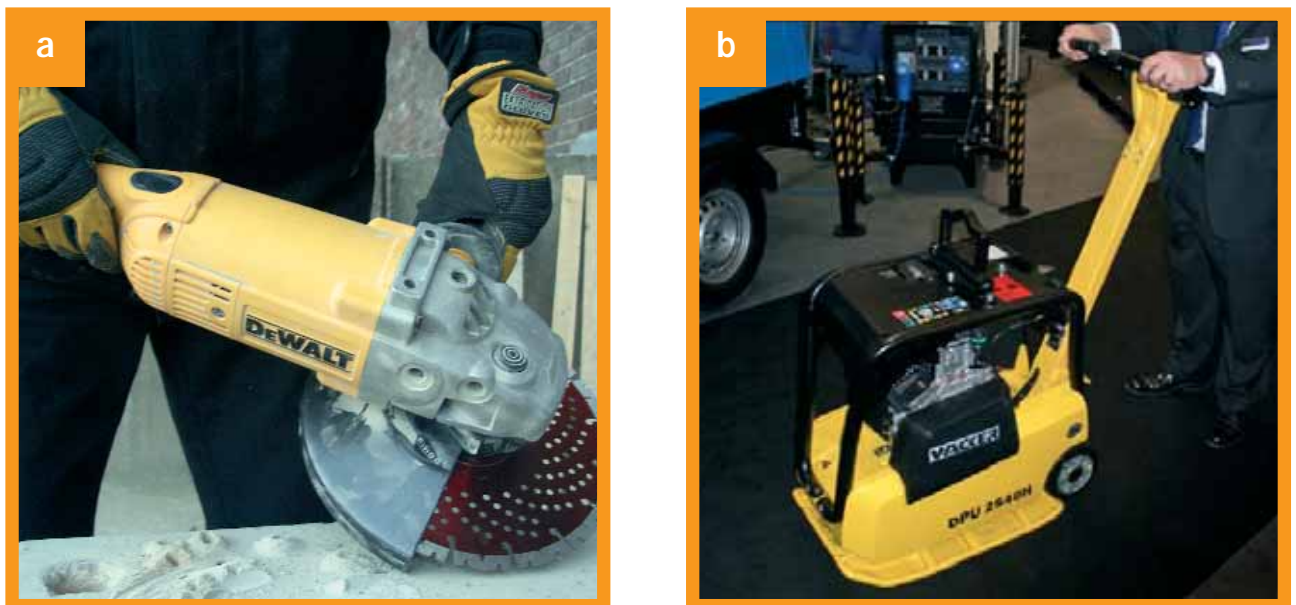
The three main sources of HAV are:

- **hand-held power tools**, such as pneumatic breakers or hammer drills;
- **hand-guided machinery**, such as pedestrian lawn mowers or compaction plates; and
- **materials that are held whilst being worked upon by a vibrating process**, such as steel components being held to a grinder, or timber being guided through a band saw.

Figure 1 shows two typical sources.

There is a risk, that over time, exposure to this vibration can cause a range of medical conditions relating to damage to the blood vessels, nerves, muscles and joints of your hands, wrists and arms. These medical conditions are often collectively called **Hand-arm Vibration Syndrome** or HAVS.

Figure 1. Sources of HAV include hand-held tools that vibrate (a) and hand-guided machinery (b)



So at this point, in order to avoid any confusion of terms, you should remember that:

- **hand-arm vibration (HAV)** – is how we describe the actual vibration that comes into contact with your hands (and arms) from vibrating tools or processes; and
- **hand-arm vibration syndrome (HAVS)** – refers to the range of medical conditions that can result from prolonged exposure to HAV.





The Health and Safety Executive (HSE) estimate that about 5 million people are exposed to HAV, with up to 2 million being exposed at levels which put them at particular risk of developing HAVS. Although these people work in many different industries and jobs, using many different types of vibrating machinery, they all share one thing – risk to their health. The greater the amount of vibration they are exposed to and the more frequent that exposure is, the more they are at risk.

Hand-arm vibration is considered such a serious risk to health, that in 2005 the Control of Vibration at Work Regulations were introduced in the UK. These regulations require your employer to manage your risks from HAV. However, there are also things which you, as an employee, can do to reduce your exposure to HAV and to help your employer look after your health.

We will consider all these issues surrounding HAV later in the module, but first let us look in more detail at how having HAVS could affect you, your work and your home life.

**Hand-arm vibration syndrome** is a serious condition that can lead to permanent medical damage, affecting both your ability to work and to enjoy a variety of social activities. However, **HAVS is preventable**, so it is important that you are able to recognise its symptoms as early as possible. The main symptoms are summarised in figure 2.

HAVS symptoms, and their associated medical conditions, are normally grouped according to which system of your body they affect:

- vascular (affecting the blood vessels) ;
- neurological (affecting the nerves); and
- musculoskeletal (affecting the muscles and joints).

Figure 2. Symptoms of hand-arm vibration syndrome



### Vascular Disorders

These disorders generally occur as a result of damage to the blood vessels supplying your hands and fingers. An early sign to look out for is if your fingertips sometimes go white, or 'blanch' - a condition commonly called **Vibration White Finger** (see figure 3). Although it is vibration that causes the condition, the blanching attacks are usually triggered when your hands (or body) become cold or wet.

There are two stages to an attack, which can last from a few minutes to more than an hour, depending on the individual and how severe the attack is:

- Stage 1 Your fingers will turn **white** (and then sometimes blue), as the blood vessels narrow and stop the blood flow (and oxygen) to them. You will also get pins and needles in your fingers or they will become numb.
- Stage 2 Your fingers will turn **red** as the blood vessels re-open and the blood flow returns. As this happens they will tingle and throb which can be very painful.

**Figure 3. Vibration white finger**



(courtesy of the Raynaud's & Scleroderma Association)

Although the symptoms may be mild at first, if no action is taken to change your exposure to vibration, they can become much worse. The blanching will spread further down your fingers and the attacks will happen more often, with less exposure to cold needed to set them off.

Eventually, increased numbness during an attack will mean that you lose sensitivity and movement in your fingers, making it difficult to feel or pick up small items. In extreme cases the numbness can become permanent and gangrene result, leading to the loss of the finger(s) affected.

### Neurological Disorders

These disorders generally result from damage to the nerves in your hands and lower arms. You may become aware of this by a tingling and numbness in your fingers, which at first may be occasional and mild, only affecting the tips of the fingers.

If your vibration exposure does not change however, the damage to your nerves will continue. The numbness will spread further along your fingers and may become permanent. Your sense of touch and temperature will be affected as well as your manual dexterity. These effects of the nerve damage will make your hands feel clumsy, as it becomes difficult to handle small, or delicate, objects.

Exposure to hand-arm vibration can also increase the risk of **carpal tunnel syndrome**, which is a condition where the 'median' nerve in your wrist becomes trapped or squashed. The symptoms are tingling and numbness in parts of your hands, which is worse at night and may be painful enough to disturb your sleep. You may get a feeling of weakness in your hands and find that your ability to grip things is affected.

## Musculoskeletal Disorders

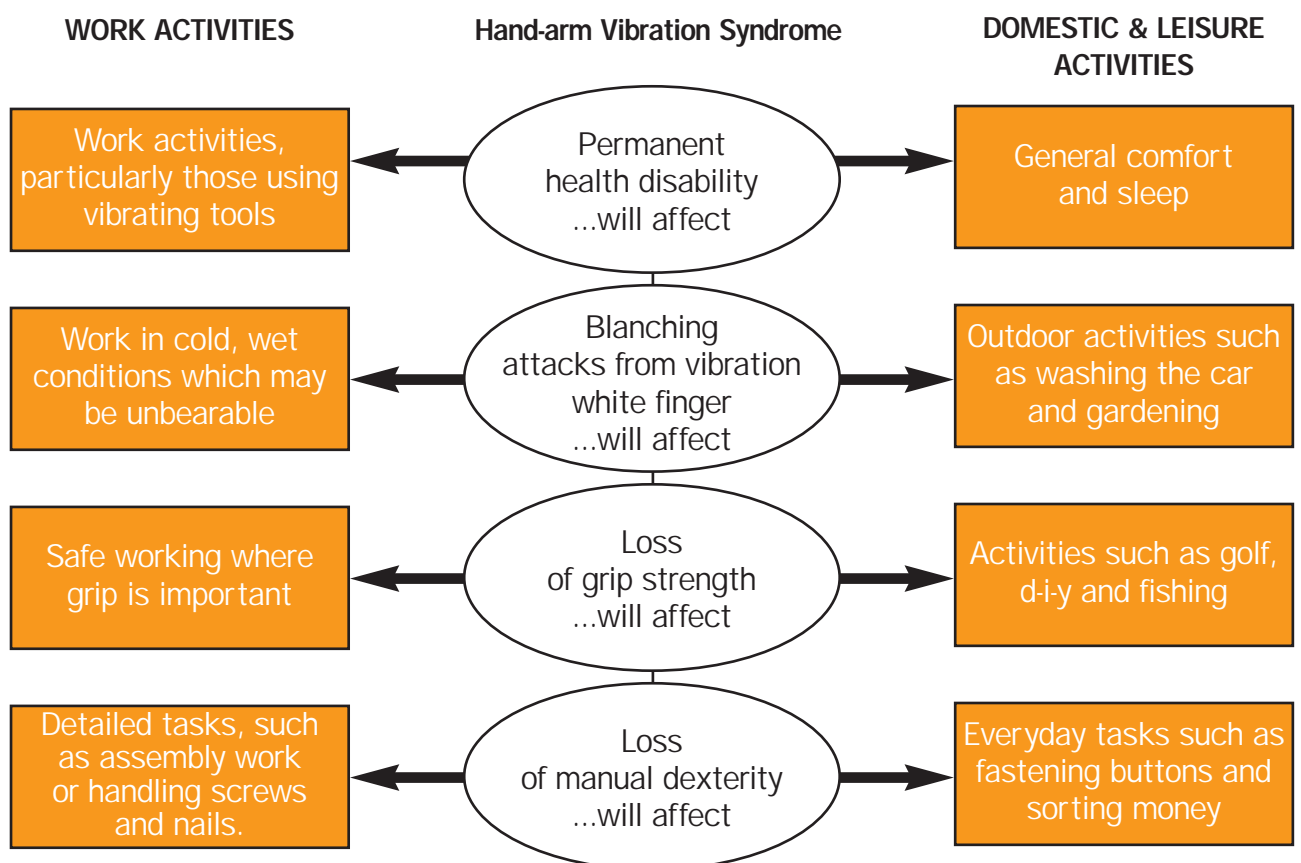
These tend to result in general discomfort and stiffness in your fingers, hands, wrists and arms. If muscles get damaged, then you may notice a loss of strength and grip when using your hands. You may also be at increased risk of developing osteoarthritis in the wrists and elbows.

If you experience any of the HAVS symptoms discussed above, report them to your employer and healthcare provider as soon as possible. HAVS can progress (even after you stop using vibrating tools or processes) and become severely disabling. If you ignore early symptoms of HAVS and continue the same use of vibrating tools, rather than seeking medical advice, the condition could progress (see figure 4) such that:

- you may not be able to work in cold or wet conditions due to the pain of the blanching attacks;
- you may not be able to continue working with vibrating tools;
- the type of work you can do safely is limited, due to loss of dexterity and grip strength;
- you suffer pain and discomfort, which can disturb your sleep; and
- your non-work activities are affected so you cannot play certain sports, do housework or d-i-y, or even fasten your buttons or turn the pages in a book.

It is clear that the risk to your health from HAV **must be taken very seriously**. During 2001, 3,300 people claimed disablement benefit, as a result of being diagnosed with vibration white finger.

Figure 4. The effects of hand-arm vibration syndrome on your work and non-work activities



Recognition that you have some HAVS symptoms is an obvious way to tell that you are at risk from using vibrating equipment.

**If you get a tingling sensation or numbness in your fingers while using vibrating equipment, or shortly thereafter, you may be at risk from HAV, so seek advice.**

However, by being aware of how you can be exposed to HAV at work and the factors that can affect your risk, you may be able to help your employer to control your exposure, before your health is damaged.

## Jobs and Tools Which May Involve HAV

The types of job which offer the most risks from HAV are those that require **regular and frequent use of tools and equipment that cause vibration**. These kinds of job may exist within various types of work.

Work which may involve exposure to HAV	
construction work	demolition work
forestry	foundry work
heavy engineering work	mining and quarrying
parks & ground maintenance	public utilities (electricity, gas, water etc)
railway construction/maintenance	road construction/maintenance ...etc.

Likewise, there are many types of tool, or work process, used within these jobs, which may expose you to HAV.

Equipment which may involve exposure to HAV		
Hand-held power tools		
breakers	chainsaws	disk cutters
grinders	hammer drills	impact wrenches
riveting hammers	sanders	scabblers ...etc.
Hand-guided equipment		
compactor plates	floor polishers	floor sanders
powered lawn mowers	strimmers	...etc.
Hand-fed machinery		
circular saws	jigsaws	pedestal grinders
pedestal polishers		...etc.

The examples listed above are just some of the more common jobs and tools which may expose you to HAV, but there are many others, so it is perhaps better to consider that:

**If you regularly use vibrating hand-held tools or machinery at work, whatever the job and whatever the tool, your health may be at risk from hand-arm vibration.**

### Level of Vibration

Every vibrating tool or work process produces a different amount of vibration, which will depend on:

- the type of tool - for instance, hammer action tools produce more vibration than rotary tools;
- what the tool is used for – for example, drilling into a hard material will produce more vibration than drilling into a softer one; and
- whether the tool is vibration-reduced - which can affect the vibration level significantly.

The higher the vibration level of a tool, the less time you can use that tool before being at risk from HAV. The HSE advise that if you regularly operate hammer action tools for more than about *15 minutes* per day or some rotary (and other 'action') tools for more than about *one hour* per day you may be particularly at risk.

Based on HSE 'general' guidance, table 1 gives a few examples of specific tool types, and typical maximum daily usage times. The longer time period that each tool can be used is based on the assumption that the tool has been designed and manufactured to produce low vibration levels. Where tools are not 'vibration-reduced' in this way, then the shorter time period will apply.

If you want to find out whether the tools you use are vibration-reduced, it is probably best to first ask your employer, who should be able to get this information from trade literature or from the manufacturer of the tool.

**Table 1. Some tool types and approximate ranges of maximum daily usage times**  
(based on low vibration and high vibration examples of each tool type)

Tool type	Range of maximum time usage
Road breakers	From 30 mins to 8 hours
Demolition hammers	From 20 mins to 3 hours
Hammer drills	From 20 mins to 5.5 hours
Large angle grinders	From 3 hours to 12 hours
Chainsaws	Typical = 5.5 hours
Orbital sander	Typical = 2.5 hours

*Remember – specific circumstances may cause significant variation to these times*

## Other Factors Affecting Your Risk from HAV

Apart from the level of vibration produced by the tool or process that you are operating, there are other factors surrounding its use that can have an influence on the amount of risk to your health, including:

- How long you use the equipment for, and how often;
- How much force you use to grip, push or guide the machine or tool;
- How cold and wet you are when using the equipment;
- How poor your posture is;
- How susceptible you are, which may be affected by previous injuries and your medical history; and
- How much you use vibrating tools or machinery in your non-work activities

In practice this means that the nature of your working conditions, the type of vibrating tools you use and you as an individual will all tend to dictate the amount of HAV risk. Because of this, HAVS symptoms might appear for one person after only a few months of (usually severe) exposure, while for another person working in different conditions (or with different tools), it might take several years.

Although it is difficult therefore, to say how long it would take a person to develop HAVS, the following two points do generally apply:

- **the greater the amount** (sometimes called the '**magnitude**') of vibration reaching your hands and arms; and
- **the longer you are in contact with the vibration** (normally called the '**exposure time**'),

**...then the greater is your risk of developing HAVS**





There are several items of general UK legislation which have for some time made provisions for protecting your health and safety at work with respect to the use of vibrating machinery. However, due to the serious health risks from HAV, new specific regulations came into force in July 2005 which place increased responsibility on your employer to control vibration risks in the workplace.

## Specific Legislation

The **Control of Vibration at Work Regulations 2005** were implemented in the UK as a result of the 2002 European Union Directive on Physical Agents (Vibration). Under these Regulations employers have a legal duty to protect their employees from the health risks which may result from hand-arm vibration.\*

The Regulations require your employer to take certain actions, depending on the level of vibration you are likely to be exposed to and they set out **action** and **limit** values to control this. These values define specific amounts of vibration exposure, measured using a formula known as an A(8) value – which is the average (A) exposure over an eight-hour (8) working day.

The **Exposure Action Value** (EAV), which is  $2.5 \text{ m/s}^2 \text{ A(8)}$ , is a level of daily vibration exposure that if likely to be exceeded, requires your employer to:

- reduce your exposure to a level as low as is reasonably practicable; and
- provide you with health checks (health surveillance).

The **Exposure Limit Value** (ELV), which is  $5 \text{ m/s}^2 \text{ A(8)}$ , is a level of daily vibration exposure that **must not** be exceeded. If it is, your employer must

- take immediate steps to reduce your exposure below this level.

If you have any exposure to HAV, regardless of the level, then your employer must also:

- assess the risks to your health and safety from the vibration;
- remove the vibration risk or reduce your exposure to a level as low as is reasonably practicable; and
- provide information and training on HAV, the risks to your health and ways to minimise this risk.

## General Legislation

There are other laws and regulations which can be applied to the use of hand-held vibrating machinery or work processes and the risks of exposure to HAV. You do not need to be concerned with all the detail of these, but we will look at some of them briefly as they place responsibilities on your employer, on you (as the operator of the tools or machinery) and on the manufacturer and supplier of vibrating equipment.

\* The Regulations also cover whole-body vibration – this subject is covered in a separate OPERC module: Module Ref OPERC-SM-010 (Whole-body Vibration)

**The Health and Safety at Work etc Act (1974)** sets out general health and safety responsibilities. It requires your employer to ensure, as far as is reasonably practicable, the health and safety of all employees and anyone else who may be affected by work activities. This will therefore include HAV and the use of vibrating work equipment. With particular relevance to HAV, they must:

- provide and maintain safe equipment and systems of work (by purchasing low-vibration tools and ensuring machinery is working efficiently); and
- provide adequate information and training (on the risks of HAV and the safe use of vibrating tools or processes).



Under the same Act, you also have legal duties, which in the context of HAV include:

- to take reasonable care of your own health and safety and that of others who may be affected by your work (by proper use of the vibrating machinery);
- to co-operate with your employer on all health and safety matters (by using any vibration control measures your employer has provided); and
- to not interfere with, or misuse, anything provided for your health, safety and welfare (such as anti-vibration mounts or handles).

The ***Provision and Use of Work Equipment Regulations (PUWER) (1998)***, as amended 2002, require your employer to prevent or control the risks to your health and safety from using equipment at work. The equipment should be (and in the context of HAV):

- suitable for the work task you have to do (if not suitable, you may be exposed to more vibration);
- safe to use and maintained adequately (a faulty, or worn, tool can increase the vibration level and take longer to do the job);
- used by you only if you have received adequate information and training (on how to use the tool and the risks from HAV); and
- accompanied by appropriate safety controls (such as a safety guard on a disk cutter).

The ***Supply of Machinery (Safety) Regulations (1992)***, as amended 2005, require manufacturers and suppliers to ensure that machinery is safe to operate when supplied and is CE-marked to indicate this. With respect to HAV, they must ensure that equipment is:

- designed to minimise the risks of vibration exposure;
- supplied with details of its vibration emissions and a warning about the vibration risks from using the equipment; and
- supplied with information on how to use it safely and how to maintain it.

Under the ***Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (1995)***, your employer must, when notified by a doctor, report to the HSE any cases of HAVS (or carpal tunnel syndrome) that result from certain work activities, which are listed in the regulations.

If your job involves work which exposes you to HAV, then your employer must, by law, assess the risks to your health. If the **risk assessment** shows that your health is likely to be at risk, then your employer must then take certain actions, which are to:

- introduce **control measures** to reduce your exposure to HAV;
- provide you with **health surveillance**; and
- give you **information and training** on HAV and the risks to your health.

We will now look briefly at the risk assessment and the actions which may follow, so that you understand what they involve and how they are carried out.

## Risk Assessment

The purpose of the risk assessment is for your employer to find out if you are at risk from HAV and if so, to identify what can be done to reduce that risk. To do this will involve studying you and your work activities, in order to calculate your personal **daily vibration exposure**, which can then be compared against the Exposure Action and Limit Values, as defined in the *Control of Vibration at Work Regulations 2005*.

In order to assess your risk from HAV, your employer will first need to collect information on the following things:

- what types of vibrating equipment you use;
- what you use the equipment for;
- how long you are in contact with the equipment while operating it;
- how often you use the equipment (your usage pattern);
- the working conditions you operate the equipment in, such as the temperature; and
- whether you are at particular risk, for example, if you already have HAVS or another disease which may make you more likely to be affected by vibration.

This information will then be used to make an estimation of your daily vibration exposure and assess your risk from HAV. Your employer may initially carry out a basic assessment, to find out your level of risk (high, medium or low) and then, depending on the results, follow this with a more detailed assessment to calculate your actual daily exposure as an A(8) value.

### Basic Assessment

A broad assessment of your risk can be carried out by, for example, applying the following 'rule of thumb' guidance provided by the HSE.

If you regularly operate:

- hammer action tools for more than about *15 minutes* per day; or
- some rotary and other 'action' tools for more than about *one hour* per day;

...you may be at **medium risk** by being exposed above the vibration Exposure Action Value.

If you regularly operate:

- hammer action tools for more than about *one hour* per day; or
- some rotary and other 'action' tools for more than about *four hours* per day;

...you may be at **high risk** by being exposed above the vibration Exposure Limit Value.

### *Detailed Assessment*

If your employer decides to undertake a more measured estimation of your daily vibration exposure, then for each vibrating tool or work process that you use the following will need to be calculated:

1. the **vibration magnitude**

which should be representative both of the specific tool and the work (or work process) that is done with it. Your employer may be able to get this vibration data from the manufacturer (or supplier), or from an independent source, such as the web-based database provided by OPERC's *Hand-arm Vibration Testing Centre* (HAVTEC) – [www.operc.com/pages/havtecwelcome.asp](http://www.operc.com/pages/havtecwelcome.asp); and

2. your **daily exposure time**

which should be how long your hand is actually in contact with the tool (or work process) whilst it is being operated – this is often called the 'trigger time'.

Using this pair of figures (vibration magnitude and exposure time), for each vibrating tool you use, your daily vibration exposure can be calculated and compared to the Exposure Action and Limit Values in the Regulations. Your employer will then assess your risk from HAV, taking into consideration other factors such as the information gathered on your working conditions and whether you are personally at particular risk.

Both the process and outcome of your risk assessment will be recorded and your employer will inform you of the results and also of any actions which are to be taken, such as control measures, health surveillance and training.

### **Health Surveillance**

Health surveillance is basically a series of regular health checks, to:

1. check whether you are at *particular* risk from HAV, e.g. if you suffer from a condition such as diabetes, where your blood circulation is affected;
2. check whether you have any early symptoms of HAVS; and
3. (if you have HAVS), help you to stop the disease from getting any worse, so that you can keep in work.

It is important for your health therefore to cooperate as fully as you can with any health surveillance that your employer provides for you, but if you do think you have any symptoms of HAVS or you think that they have progressed, don't wait for your next health check – report it to your employer or health provider straight away.

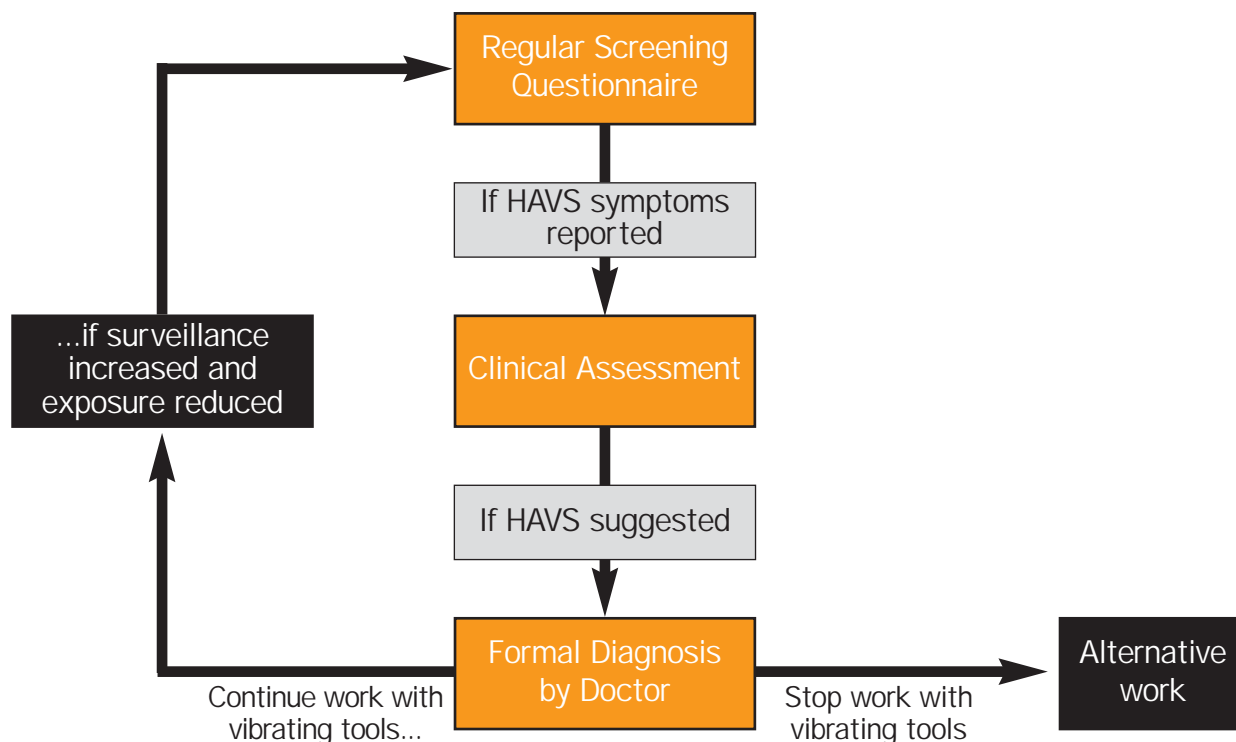
If you are considered to be at risk from HAV, when you first start work for your employer, and every year thereafter, you will receive a health check which will essentially consist of answering a short 'screening' **questionnaire**. The questions are designed to detect whether you may have early HAVS symptoms, so it is important to answer them carefully. The health check also gives you an opportunity to learn more about HAVS and what you can do to reduce your risk (which we will consider later).

Where your answers show some possible early symptoms of HAVS, you will be sent for a **clinical assessment** by a qualified person such as an occupational health nurse. This will involve:

- a 'clinical' questionnaire, which will ask more detailed questions about your symptoms, your medical background and your history of using vibrating tools or equipment, both at work and outside work; and
- a clinical examination of your hand and arm, which may include some tests to look at things like your sense of touch, manual dexterity and grip strength.

Although the assessment may suggest that you have HAVS, a **formal diagnosis** must be made by a doctor to confirm this. When this happens, the doctor will give you further advice on the disease and how it could progress and will also make recommendations on your future fitness for work, which will depend upon how severe your symptoms are. It may be that you can continue to work with vibrating tools, as long as your exposure is reduced and you have more frequent health checks, or it may be that you are advised to stop working with vibrating tools altogether, to prevent the disease developing and causing you permanent disability. Figure 5 provides a summary of the health surveillance process.

Figure 5. Health surveillance



## Information and Training

There are various ways that your employer can provide you with information on HAV, such as booklets, DVD's, tool-box talks, one-to-one discussions and training sessions – this module may be one such way. Regardless of the method of delivery, there are certain things which your employer should make sure you are informed about. Some of these may be general, such as what HAV is and how it can affect you, and some may be specific to your workplace setting, such as what measures your employer has taken to reduce your exposure to HAV.

Figure 6 provides a summary of the information, or training, you should be given – if you are in doubt about any of this, speak to your employer:

**Figure 6. HAV information and training for employees**



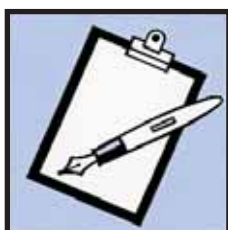
### Your Health

- The effects of HAV on your health
- How to recognise and report HAVS symptoms
- What your health surveillance will involve and why it is important
- The results of your health surveillance and what will happen next
- How to look after the health of your hands and arms



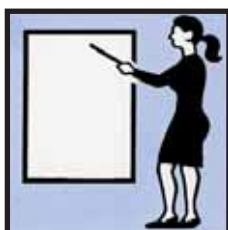
### The Law

- The laws or regulations which apply to HAV
- Your duties and your employer's duties regarding HAV
- The vibration exposure action and limit values (EAV and ELV) and what they mean



### Risk Factors

- Which tools or work processes can expose you to HAV
- How the level and duration of the vibration affects your risk
- What other factors can affect the risk
- The results of your risk assessment and how your daily exposure level compares to the EAV and ELV



### Controls & Actions

- What control measures your employer has put in place to reduce your vibration risk
- How to select, use and maintain your equipment to minimise your vibration exposure
- What safe working practices you should follow

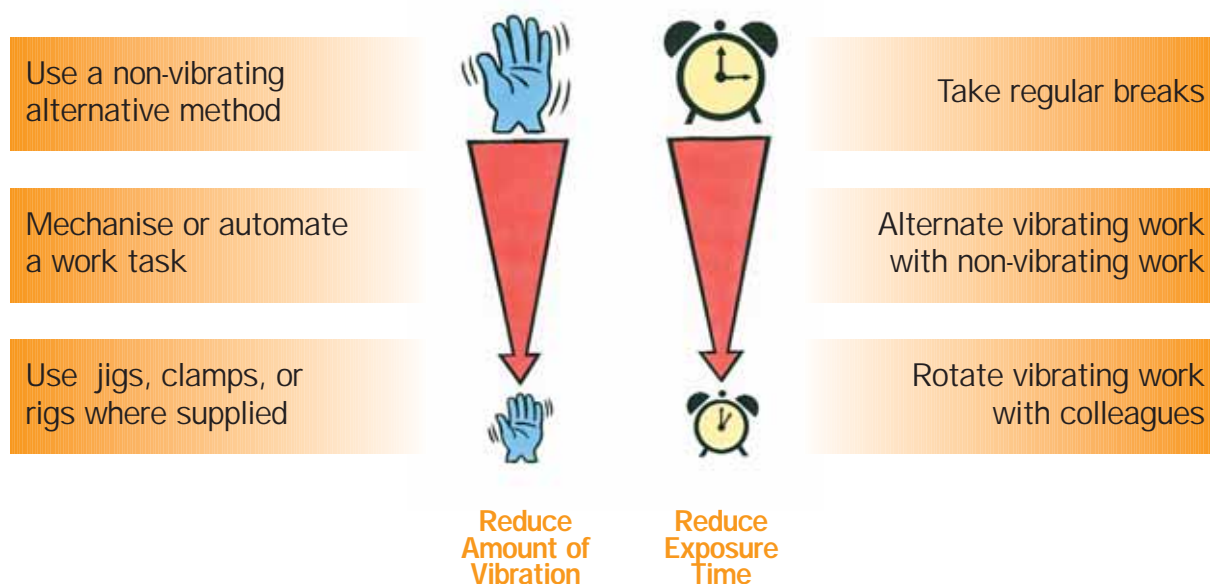
## How Can I Protect Myself from Hand-arm Vibration?

Although it is your employer's responsibility to protect you against HAVS, there are many things which you can do to help minimise your exposure to HAV and look after the health of your hands and arms.

### Change the Way That You Work

Making changes to the way that you work can reduce both the amount of vibration you are exposed to and how long you are exposed to it for – see figure 7.

**Figure 7. Change how you work to reduce your risks from hand-arm vibration**



By finding a different way to do a job you can **remove, or reduce, your level of exposure** from vibrating mechanical tools or vibrating work processes.

This could result from applying mechanisation or automation to a task and/or from making improvements to the design of your workstation. For example, in the case of vibrating work processes, a jig or guide can be used, instead of your hands, to hold and manoeuvre materials being worked upon by the vibrating machinery (such as a grinder). For hand-held vibrating tools, a rig can be used to hold the tool. Figure 8 shows an example of this – where a rig is being used to operate a core cutter – instead of holding the cutter in the hands.

Alternatively, it may be that you could use a remote-control piece of equipment, rather than a hand-guided one, to do a job, for example a remote control compactor plate.



Figure 8. Example of using a rig to operate a power tool



Where it is not possible to remove the vibration from a work task, then try to **reduce how long you are exposed** to it, by taking regular breaks. Several short periods of vibration exposure are better than one long, continuous stretch. There may be non-vibrating work that you can do in between using vibrating tools or processes.

If a job, by its nature, does require long periods of vibrating tool use, rotate that use among several people, rather than one person using them most of the time.

Good communication with your employer is important – they have a legal duty to protect you from HAV. Ask if any changes can be made to the way that you do your work and co-operate with any actions they may take.

### Select the Right Tool for the Job

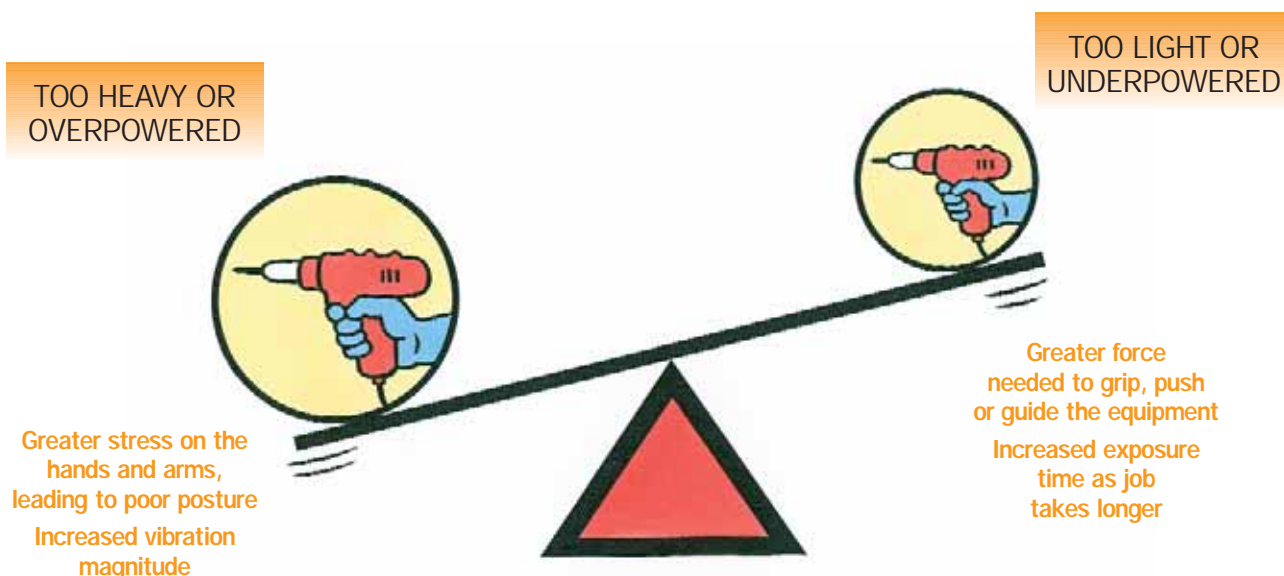
When selecting a tool to use for a task, wherever possible choose one that is non-vibrating or one that has a low vibration level. Your employer should have a policy of only purchasing, or hiring, the lowest vibration tools that are suitable for your workplace – if in doubt, ask.

It is just as important, however, that you select the most suitable tool for the job that you are doing (in terms of size, output, weight, etc.), so that it is done as efficiently as possible (see figure 9).

A tool that is too light or underpowered for the intended work, may cause you to grip the tool more tightly, which can in turn increase your vibration exposure. It may also take longer to complete the job, which will increase the time you are exposed to the vibration.

A tool that is too heavy might place greater stress on your hands and arms and lead to poor posture, while a tool that is overpowered might generate more vibration than another more suitable one.

Figure 9. The balance of tool selection



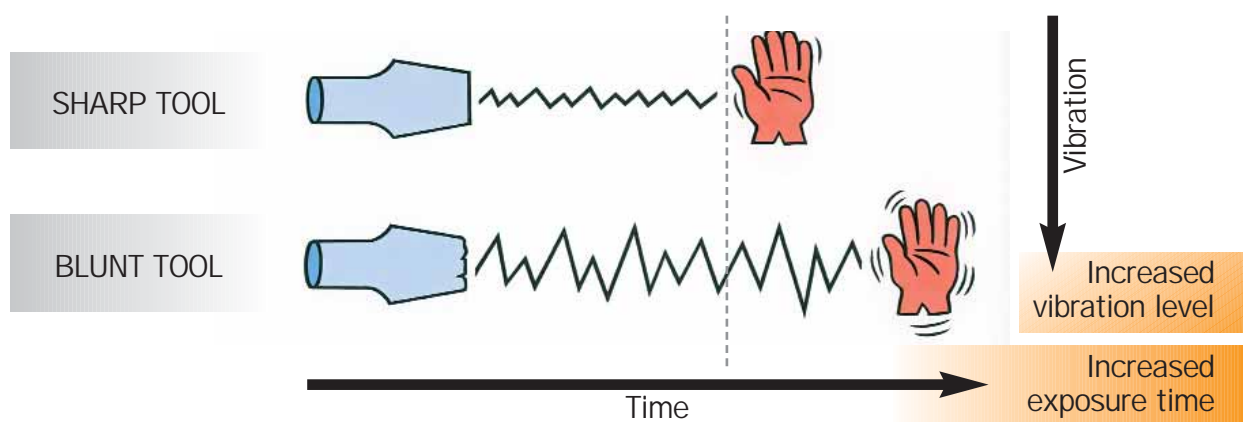
The accessories for the tool you are using should be selected with care, as this can also affect your vibration exposure. Choosing the wrong one for the job you are doing could increase your exposure, even if the tool you choose is correct for the job.

## Keep Tools in Good Working Order

The tools and equipment you use need to be properly maintained in order to keep them working efficiently and safely. This helps to avoid unnecessary extra vibration which may occur as a result of faults or general wear and tear.

Furthermore, a tool that is not working efficiently will take longer to do a job, for example if you use a blunt chisel rather than a sharp one. This will increase the time you are exposed to the vibration and may also mean that you grip the tool more tightly, which will increase the vibration level (see figure 10).

**Figure 10. The effects of poor maintenance**



The following table gives some examples of maintenance which will help to keep your vibration exposure to a minimum.

**Table 2. Examples of necessary maintenance of vibrating equipment**

Part	Action
Breaking/cutting chisels	Keep sharp; replace regularly and when damaged.
Chainsaw teeth	Keep sharp and at the correct tension.
Cutting discs/blades	Keep sharp; replace regularly and when damaged.
Grinding wheels	Dress correctly*.
Moving parts	Keep lubricated*.
Rotating parts	Ensure correctly balanced.
Vibration-reducing handles	Check for swelling, hardening or cracking.
Vibration-reducing mounts	Check for deterioration. Replace before they wear out.

\* According to manufacturers' instructions.

## Use Safe Working Practices

The way you use tools and equipment in your work can greatly influence the amount of vibration that you will be exposed to. You should take some personal responsibility for how you carry out a task and try to consider safe working practices at each stage of your work (see figure 11).

Before starting a task, check your tools for any signs of wear or damage, including any vibration-reducing measures that have been fitted, such as mounts or handles. Also consider whether the tool is right for the job that you are about to do.

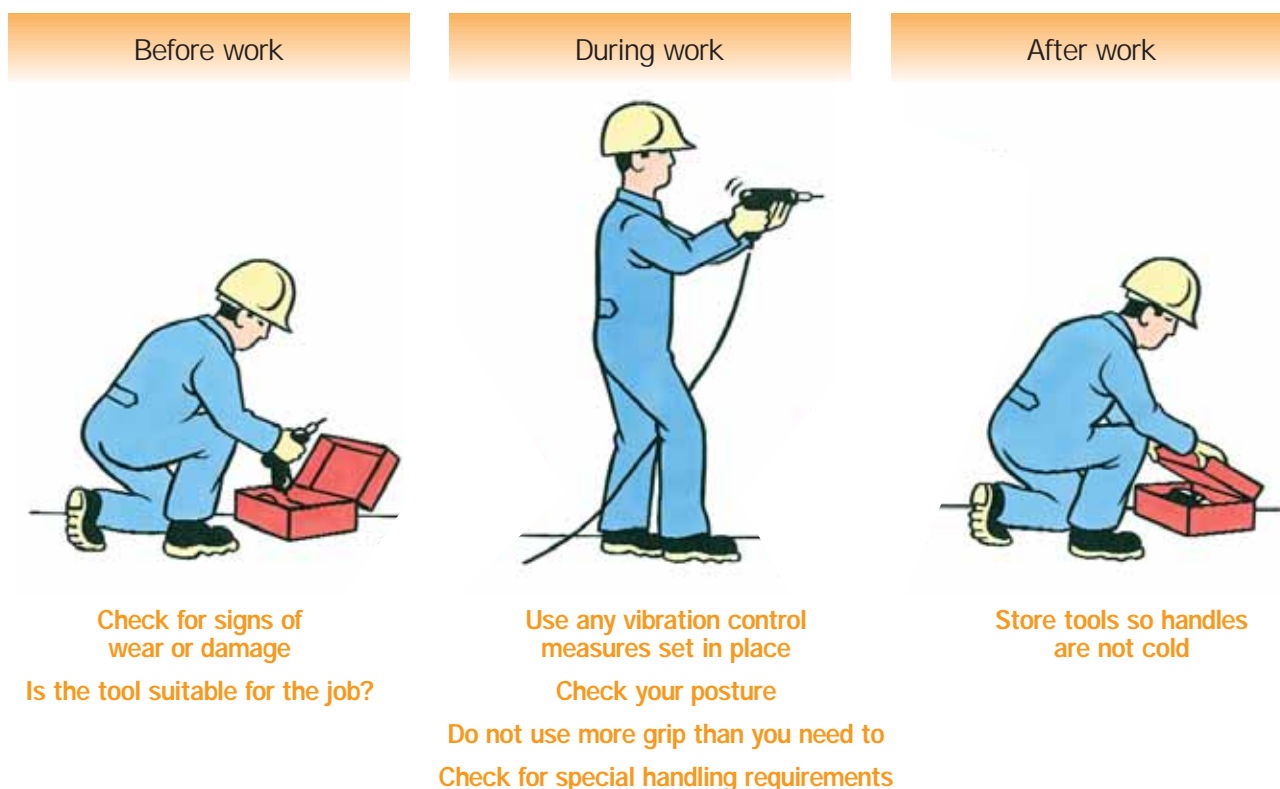
When using vibrating tools or equipment, be aware that poor posture can place additional strain on your hands and arms. Using more grip or force than necessary also places extra strain on the hands and arms and makes the problems of HAV worse. The grip should be just enough to safely support the tool, control or guide it where necessary and perform the task. It may also be that the tool you are using has special handling requirements, so check for these and follow them if this is the case.

Be aware that you have a legal duty to use any vibration control measures that your employer has put in place. For example, these might include maximum time periods for use of a particular piece of equipment or the use of purpose made jigs for carrying out certain work processes.

When you finish work store tools, especially those with steel grips, so that they do not have very cold handles the next time they are used, because cold grips can make the problems of HAV worse.

Your employer should ensure that you are trained in all aspects of safe working practices, but if in doubt ask – it is your health that is at risk.

**Figure 11. Use safe working practices at all times**



## Look After the Health of Your Hands

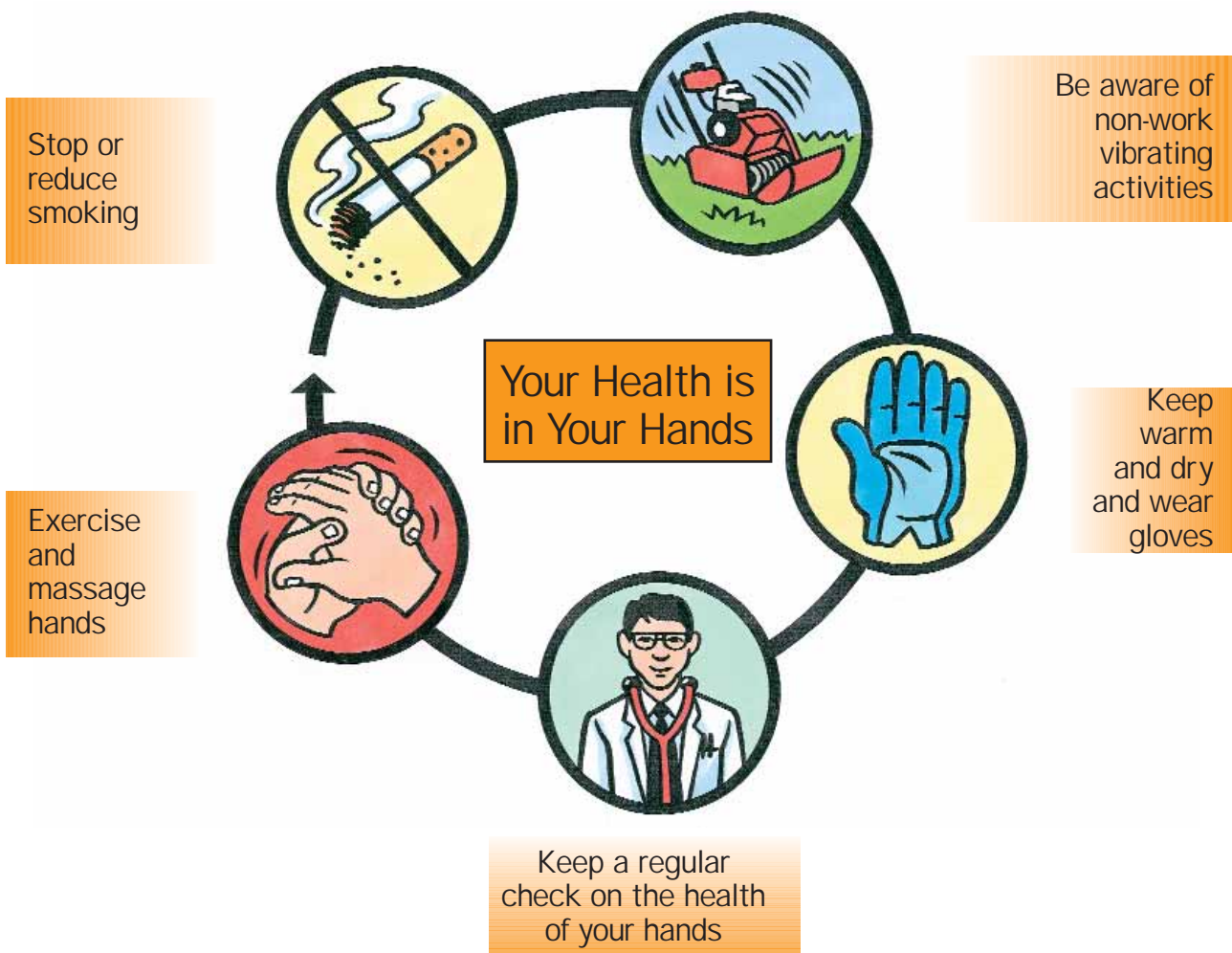
There are positive actions you can take to look after the health of your hands (and arms) and lessen the risks from working with vibrating tools or machinery. Figure 12 provides a summary of these, which we will now consider.

Poor blood circulation can increase the risk of developing HAVS symptoms, particularly Vibration White Finger, so maintaining good circulation (especially in the hands) is important. This is particularly the case if you work outside in Winter months as cold, damp conditions inhibit blood circulation. Keep warm and dry by wearing extra clothing and gloves and using heated pads.

Giving up or cutting down on smoking can help improve your blood circulation because smoking reduces blood flow. It may also help if you can exercise or massage your hands and fingers during breaks from work.

Above all, keep a check on the health of your hands and report any symptoms of HAVS immediately to your employer and healthcare provider. Cooperate with your employer in any health surveillance provided, as this is a critical part of identifying HAVS symptoms early in their development and preventing them from progressing further.

**Figure 12. Look after the health of your hands**



You should also remember that certain activities that you undertake outside of work may also involve the use of vibrating tools or machinery, such as mowing the lawn or riding a motorcycle. Their use can increase your daily vibration exposure and in turn increase your risk of developing HAVS.

Finally, if you do think that you might have any of the symptoms of HAV, it is important that, as soon as possible, you:

- report these to your employer;
- seek medical advice; and
- ask your Health and Safety Officer, or similar representative, for advice regarding continuing use of vibrating tools and equipment.

Let's summarise what you have learned from this module:

### What is Hand-arm Vibration?

- **Hand-arm vibration** (HAV) is vibration that comes into contact with your hands and arms, usually as a result of undertaking mechanised work activities.
- The main sources of HAV are hand-held power tools, hand-guided machinery and materials being processed by vibrating machinery.
- Prolonged exposure to HAV can cause **permanent damage** to your health.
- 5 million people are exposed to HAV - up to 2 million of these are at a potentially dangerous level of risk.

### How Can Hand-arm Vibration Affect My Health?

- HAV can cause damage to the blood vessels, nerves, muscles and joints of your fingers, hands, wrists and arms.
- **Hand-arm Vibration Syndrome** (HAVS) is the name given to the range of medical conditions that can result from exposure to HAV.
- HAVS symptoms include pins and needles, numbness, finger blanching (Vibration White Finger), aches and pains, stiffness, loss of grip strength, loss of sensitivity, loss of manual dexterity.
- **HAVS is preventable**, so early detection and reporting of symptoms is essential.
- If HAVS is allowed to progress, it will affect your ability to work (especially with vibrating equipment) and to enjoy a full and active social and domestic life.

### Am I at Risk from Hand-arm Vibration?

- The types of job offering the most risk from HAV are those that require **regular and frequent use of tools and equipment that cause vibration**.
- The amount of vibration produced by a tool or process can vary significantly depending upon the type of tool, what it is used for and whether it is vibration-reduced.
- The higher the vibration level, the less time you can use a tool or process before being at risk.
- The HSE advise that if you regularly operate hammer action tools for more than about 15 minutes a day, or some rotary tools for more than about one hour a day, then you may be at particular risk.
- Factors that can affect your level of risk from HAV are:
  - the vibration magnitude of the tool or process;
  - how long and often you use the equipment;
  - how you operate the equipment (posture, how tight a grip you use);
  - your working conditions (if you are cold or wet);
  - your personal circumstances (medical history, previous injuries and use of vibrating machinery outside of work).

- **The greater the amount (magnitude) of vibration** that is in contact with your hands and arms and **the longer you are exposed to it**, then **the greater will be the risk**.
- HAVS symptoms might appear for some people after a few months of vibration exposure, while for other people working in different conditions (or with different tools), it might take several years.

### What Legislation Applies to Hand-arm Vibration?

- **The Control of Vibration at Work Regulations 2005** place a legal duty on your employer to control your risks from HAV and protect you against HAVS.
- If you are exposed to HAV, your employer must:
  - assess the risks to your health and safety;
  - introduce control measures to remove or reduce your exposure; and
  - provide you with information and training.
- If your daily vibration exposure is above the **Exposure Action Value** of **2.5m/s<sup>2</sup>** then your employer must also provide you with health surveillance.
- The **Exposure Limit Value** of **5m/s<sup>2</sup>** not be exceeded.
- The *Health and Safety at Work etc. Act 1974* (HASWA) requires your employer to ensure your health and safety, as far as is reasonably practicable. This includes providing and maintaining safe systems of work and providing adequate information and training.
- Under HASWA you also have legal duties to take reasonable care of your health and safety, co-operate with your employer on all health and safety issues and not interfere with, or misuse anything provided for your health and safety.
- The *Provision and Use of Work Equipment Regulations 1998* (PUWER) require your employer to prevent or control the risks to your health and safety from using equipment at work. The equipment must be safe for use and suitable for the work you are doing.
- The *Supply of Machinery (Safety) Regulations (1992)* require manufacturers and suppliers to ensure that machinery is safe to operate when supplied. They must ensure that equipment is designed to minimise the risks of vibration exposure and is supplied with information on its vibration emissions and how to use it safely.
- Under the *Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995*, your employer must report cases of HAVS (or carpal tunnel syndrome) that result from certain work activities.

### What Must My Employer do to Protect Me From Hand-arm Vibration?

- **A risk assessment** is undertaken to find out if you are at risk from HAV and what can be done to reduce your risk.
- A basic risk assessment may use 'rule of thumb' guidance to decide whether you are at high, medium or low risk.



- A detailed assessment will measure, for each tool you use, the vibration magnitude and your daily exposure time. Your total daily exposure value (for all the tools you use) will be calculated and compared against the Exposure Action and Limit Values.
- Your risk assessment will also take into account other factors such as your working conditions and whether you personally are at higher risk due to your medical history.
- **Health surveillance** is arranged by your employer to check whether you have any symptoms of HAVS and if so, to prevent them from getting worse, so that you are fit to continue work.
- Health surveillance will usually consist of the following stages:
  - a short '**screening questionnaire**' - before you start working with vibrating tools and annually thereafter.
  - ...then, if your answers indicate you may have HAVS symptoms:*
  - a **health assessment** - involving a more detailed 'clinical questionnaire' and a clinical examination of your hands and arms.
  - ...then, if the assessment shows you probably do have HAVS:*
  - a **formal diagnosis** by a doctor, who will give you further advice on HAVS and how it can progress and also your future fitness to work.
- **Information and training** may be provided by your employer in several different ways, but should include:
  - the health risks of HAV and how to recognise and report HAVS symptoms;
  - the factors that can affect your risk from HAV;
  - the legal duties of both you and your employer with respect to HAV;
  - the results of your risk assessment and whether your level of risk is above the legal action or limit value;
  - the importance of health surveillance and how it will take place;
  - the control measures being taken to control your risks; and
  - safe working practices when using vibrating tools and machinery.

## How Can I Protect Myself from Hand-arm Vibration?

- **Change the way that you work** to remove, or reduce, your use of vibrating tools or work processes by, for example:
  - using alternative non-vibrating methods;
  - mechanising or automating a task;
  - using jigs, clamps or rigs when you can;
  - taking regular breaks from vibrating work;
  - alternating vibrating and non-vibrating work;
  - rotating vibrating work among several people.

- **Select the right tool for a job.** Although you should choose the tool that has the lowest vibration level, it is also important to choose one that is suitable for the work, so that the job is done efficiently.
- A tool that is too light or underpowered may cause you to grip the tool more tightly and may also take longer to do the work.
- A tool that is too heavy will place more stress on your hands and arms and one that is overpowered will expose you to more vibration than another more suitable one.
- You should also choose the right tool accessory for a job, as this can also affect your vibration exposure.
- **Maintain your tools in good working order** as this will keep them working efficiently and safely.
- Equipment that is not working efficiently may produce a higher amount of vibration and also take longer to do a job, thereby increasing your exposure time.
- Examples include keeping cutting tools sharp and checking anti-vibration measures for wear and tear.
- **Use safe working practices** at each stage of your work task to minimise your risks from vibration.
- Before doing a job check the tool or machinery for signs of wear or damage and make sure it is suitable for the intended work.
- During work be aware of your posture and do not grip the tool (or process) more than you have to. Make sure you know if the equipment has any special handling requirements and use any anti-vibration measures your employer has put in place.
- After work, store tools so that they do not have very cold handles the next time they are used.
- **Look after the health of your hands** to minimise the risks from HAV.
- Try to maintain good blood circulation by keeping warm whilst working in cold or wet conditions, exercising your hands and fingers during breaks and giving up smoking.
- Keep a check on the health of your hands and report any symptoms of HAVS immediately. Cooperate fully in any health surveillance provided by your employer.
- Be aware of your non-work use of vibrating tools and machinery as this can increase your daily vibration exposure and therefore your risk of developing HAVS.

## Finally

- **If you think that you might have any symptoms of HAVS then it is important to promptly report these to your employer and doctor and to ask for advice about continuing to use vibrating tools or processes.**

Having completed this module, you might now wish to test what you have learned by answering these questions. Simply choose which answer you think is correct for each question below. The answers are given at the end of the module, but try the questions for yourself before looking!

**Q1** What is 'Hand-arm Vibration Syndrome'?

- A. A source of vibration.
- B. A type of vibration.
- C. A medical condition that is caused by prolonged exposure to hand-arm vibration.
- D. A medical condition that is caused by working in wet conditions too often.

**Q2** Hand-arm Vibration Syndrome causes:

- A. Only one symptom, which is known as Vibration White Finger.
- B. Only one symptom, which is pain in the upper arms.
- C. Many symptoms, including loss of sense of touch, pins and needles in the fingers, loss of grip strength and pain in the wrist.
- D. Many symptoms, which include loss of sense of touch, pain in the lower arms, and numbness in the lower legs.

**Q3** Assume you have noticed that you are experiencing some HAVS symptoms. Should you:

- A. Stop your exposure to vibration immediately, tell your employer of the situation and seek medical advice.
- B. Do not tell your employer as this may lead to redundancy.
- C. Do not seek medical advice at this early stage because HAVS is not serious and is only a temporary condition.
- D. Stop your exposure to vibration if you can, but do not tell your employer or seek medical advice unless the symptoms get any worse than they are.

**Q4** How long does it take to develop HAVS?

- A. 3 months.
- B. 3 years.
- C. It depends on the level of exposure – the less the amount of vibration and the less the duration of exposure – the greater is the risk.
- D. It depends on the level of exposure – the greater the amount of vibration and the greater the duration of exposure – the greater is the risk.

**Q5** The types of job offering the **most risk** of HAV are:

- A. Those that require very little use of hand tools and equipment that cause vibration.
- B. Those that require regular and frequent use of hand tools and equipment that cause vibration.
- C. Those that require no use of hand tools and equipment that cause vibration.
- D. Those that involve working outside most of the time.

**Q6 The fundamental rule to help avoid HAV is:**

- A. Not to be too concerned about HAV unless you develop symptoms.
- B. Not to be too concerned about HAV because worrying about it may make the risk greater.
- C. To only use vibrating tools and equipment when wearing industrial gloves.
- D. To minimise exposure of your hands and arms to vibration from tools or work processes.

**Q7 A particular job that you have to do, might require prolonged use of a vibrating tool. Do you:**

- A. Decide on how you can break the period of tool use up into shorter periods of use and rotate the work among several of your colleagues.
- B. Complete the job using the tool regardless of how long it takes, especially if you are working to a fixed price or on peace-work.
- C. Complete the job using the tool regardless of how long it takes, so long as you wear industrial gloves and take at least one rest-break.
- D. Complete the job using the tool in shorter, one-hour periods of work.

**Q8 Under the Control of Vibration at Work Regulations 2005, if your daily hand-arm vibration exposure exceeds the Exposure Action Value of  $2.5 \text{ m/s}^2 \text{ A(8)}$  your employer must:**

- A. Remove the vibration risk or reduce your exposure to a level as low as is reasonably practicable.
- B. Provide you with health surveillance.
- C. Provide you with information and training on HAV, how it can affect your health and how you can minimise the risk.
- D. All of the above.

**Q9 Which of the following statements is true?**

- A. HAVS is a temporary medical condition. It is not considered as serious. Once symptoms are noticed, the condition will not get worse so long as gloves are worn when using power tools.
- B. HAVS can become a permanent medical condition. It should be considered as serious. Once symptoms are noticed immediate medical advice should be sought.
- C. HAVS can become a permanent medical condition. It should not be considered as serious as this may lead to worry. Once symptoms are noticed, vibrating power tools should only be used for short periods at a time.
- D. HAVS is a temporary medical condition. It should not be considered as serious unless symptoms persist for at least three months. If this happens, vibrating power tools should only be used for short periods at a time.

Q1 C

Q3 A

Q5 B

Q7 A

Q9 B

Q2 C

Q4 D

Q6 D

Q8 D

## References

- 1 Control the Risks from Hand-arm Vibration. Advice for Employers on the Control of Vibration at Work Regulations (2005). The Health and Safety Executive, document ref: INDG175(rev2), ISBN: 0-7176-6117-2.
- 2 CVWR (2005A). The Control of Vibration at Work Regulations. Statutory Instrument 2005 No. 1093. ISBN: 0-1107-2767-3 (print) or via the web at: <http://www.opsi.gov.uk/> (viewed January 2006).

# (OPERC) HEALTH AND SAFETY STUDY MODULE

Module Ref: **OPERC-SM-009**



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