

# Hand-arm vibration syndrome

Presenter: Michael J Griffin

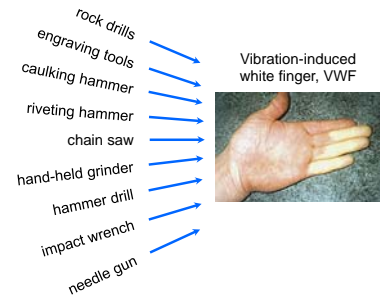
9th Southampton Hand Course  
The Working Hand  
Chilworth Manor, Southampton – 27th June 2014

## Hand-arm vibration syndrome

- Causes
- Classification – staging and scoring
- Tests to support diagnosis
- Control of Vibration at Work Regulations 2005
- Compensation

## Vibratory Tools and Processes

- Percussive metal-working tools
- Grinders and other rotary tools
- Percussive hammers and drills used in mining, demolition and road construction
- Forest and garden machinery
- Other processes and tools.



Many tools powered by:

- compressed air
- electricity
- hydraulic power
- internal combustion engines.



## Hand-arm Vibration Syndrome



## Stockholm Workshop vascular scale

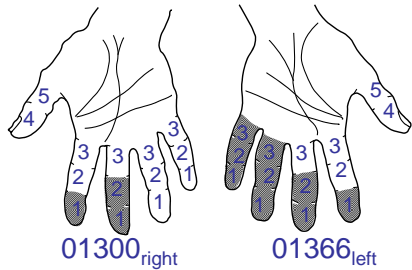
Stage	Grade	Description
0	-	No attacks.
1	Mild	Occasional attacks affecting only the tips of one or more fingers.
2	Moderate	Occasional attacks affecting distal & middle (rarely also proximal) phalanges of one or more fingers.
3	Severe	Frequent attacks affecting all phalanges of most fingers.
4	Very severe	As is stage 3, with trophic skin changes in the finger tips.

## Stockholm Workshop vascular scale

Stage	Grade	Description
0	-	No attacks.
1	Mild	Occasional attacks affecting only the tips of one or more fingers.
2	Moderate	Occasional attacks affecting distal & middle (rarely also proximal) phalanges of one or more fingers.
3	Severe	Frequent attacks affecting all phalanges of most fingers.
4	Very severe	As is stage 3, with trophic skin changes in the finger tips.

Undefined adjectives    Undefined verb    Ambiguous word or phrase

## Blanching scores



## Neurological effects of hand-transmitted vibration

## Stockholm Workshop sensorineural scale

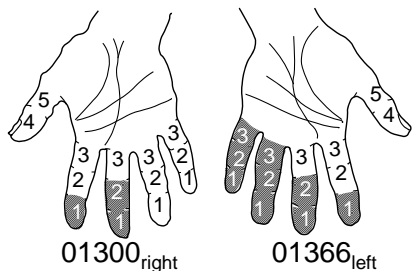
Stage	Symptoms
0 <sub>SN</sub>	Exposed to vibration but no symptoms.
1 <sub>SN</sub>	Intermittent numbness with or without tingling.
2 <sub>SN</sub>	Intermittent or persistent numbness, reduced sensory perception.
3 <sub>SN</sub>	Intermittent or persistent numbness, reduced tactile discrimination and/or manipulative dexterity.

## Stockholm Workshop sensorineural scale

Stage	Symptoms
0 <sub>SN</sub>	Exposed to vibration but no symptoms.
1 <sub>SN</sub>	Intermittent numbness with or without tingling.
2 <sub>SN</sub>	Intermittent or persistent numbness, reduced sensory perception.
3 <sub>SN</sub>	Intermittent or persistent numbness, reduced tactile discrimination and/or manipulative dexterity.

Undefined symptoms    Undefined signs    Undefined adjectives

## Numbness and tingling scores

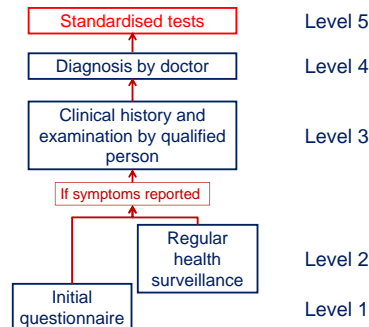


## HSE tiered system of health surveillance

The HSE currently suggest:-

"Health surveillance should be provided for vibration-exposed employees who:

- are likely to be regularly exposed above the exposure action value;
- are likely to be exposed occasionally above the action value and where the risk assessment identifies that the frequency and severity of exposure may pose a risk to health; or
- have a diagnosis of HAVS (even when exposed below the action value)."



## Tests for vibration-induced white finger: peripheral vascular response to cold

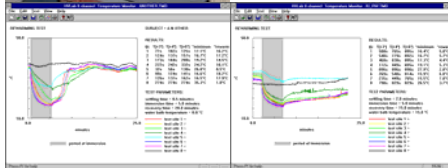
The two most common tests of vascular function:

1. Measurement of finger skin temperature following cold provocation (finger rewarming test)
2. Measurement of finger systolic blood pressure following cold provocation.



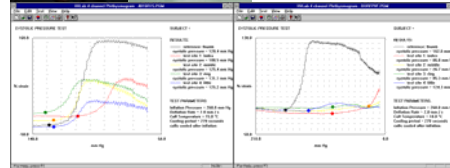
Measurement of finger skin temperature following cold provocation

ISO 14835-1: 2005



Measurement of finger systolic blood pressure following cold provocation

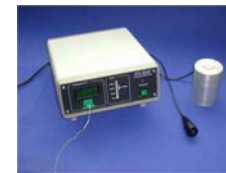
ISO 14835-2: 2005



### Tests for sensorineural dysfunction: tactile perception

The two most common tests of tactile function:

1. Measurement of vibrotactile perception thresholds
2. Measurement of thermotactile perception thresholds



Measurement of vibrotactile perception thresholds

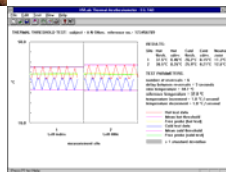
ISO 13091-1:2001

Tactile perception meter

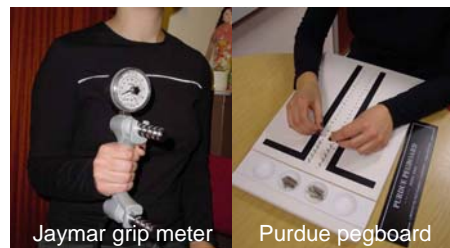


Measurement of thermotactile perception thresholds

Thermal aesthesiometer



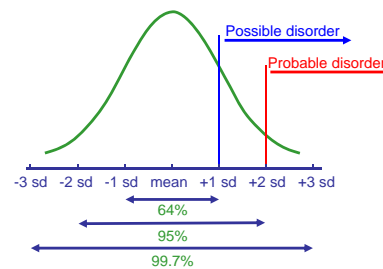
### Tests of musculoskeletal function



Jaymar grip meter

Purdue pegboard

### Normal (i.e. Gaussian) distribution



### Summary report of symptoms and signs

	Right	Left
<b>Symptoms</b>		
Unusual finger numbness	03663 <sub>3a</sub>	01100 <sub>11</sub>
Unusual finger tingling	03333 <sub>7z</sub>	00010 <sub>71</sub>
Finger clumsiness	1	1
Weakness of grip	2	2
Finger pain	1	0
Hand pain	1	2
Arm pain	0	2
Shoulder pain	2	2
<b>Signs</b>		
Vibrotactile thresholds: 31.5 Hz	0+ <b>+++</b>	00+ <b>0</b>
125 Hz	0+ <b>+++</b>	00+ <b>0</b>
Thermotactile thresholds: hot	++ <b>+</b> 0	0+00+
cold	++ <b>+</b> 0	0+00+
Dexterity	+	0
Grip force	±	+
<b>Vibration</b>		
Location of contact with vibration	23221 <sub>v</sub>	01123 <sub>v</sub>

### Control of Vibration at Work Regulations 2005

	Exposure action value	Exposure limit value
Hand-transmitted vibration	2.5 ms <sup>-2</sup> r.m.s.	5.0 ms <sup>-2</sup> r.m.s.
Whole-body vibration	0.5 ms <sup>-2</sup> r.m.s. or 9.1 ms <sup>-1.75</sup> (VDV)	1.15 ms <sup>-2</sup> r.m.s. or 21 ms <sup>-1.75</sup> (VDV)

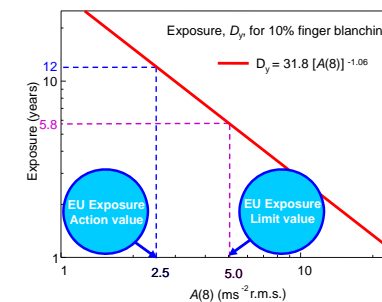
### Exposure limit value

*"workers shall not be exposed above the exposure limit value"*

If 'exposure action value' is exceeded:

- inform and warn exposed workers
- use working methods with less vibration exposure
- limit duration and intensity of vibration exposures
- .... and arrange health surveillance.

### Finger blanching probability: ISO 5349-1 (2001)



### Compensation for vibration injuries

#### Civil Courts

Many successful claims for the HAVS (both VWF and sensorineural symptoms): most settled out of court but many at court.

The court may expect that if there is a foreseeable risk:

The employer should

- provide warning of the risks,
- instruct on the proper use of tools,
- select tools with minimum vibration and arrange efficient tool and machine maintenance,
- restrict the duration of exposure to vibration in any day, and
- arrange suitable health surveillance.

### Prescription for vibration-induced white finger - since 1st April 1985 -

Episodic blanching, occurring throughout the year, affecting the **middle or proximal phalanges** (or in the case of the thumb the proximal phalanx) of **any three fingers**.

#### Occupations:

- the use of **hand-held chain saws** in forestry; or
- the use of **hand-held rotary tools** in grinding, or in the sanding or polishing of metal, or the holding of material being ground, or metal being sanded or polished, by rotary tools; or
- the use of **hand-held percussive metal-working tools**, or the holding of metal being worked upon by percussive tools, in riveting, caulking, chipping, hammering, fettling or swaging; or
- the use of **hand-held powered percussive hammers** in mining, quarrying, demolition, or on roads or footpaths, including road construction; or
- the holding of material being worked upon by **pounding machines** in shoe manufacture.

### Prescription for the hand-arm vibration syndrome - updated -

In 2004, the Industrial Injury Advisory Council recommended that prescription should be extended to include the sensorineural component:

- (1) persistent numbness or persistent tingling, or both, together with
- (2) significant and measurable reduction in both sensory perception and manual dexterity

The new scheme commenced in 2007-2008.

Prescription for carpal tunnel syndrome  
- since 19<sup>th</sup> April 1993 -

Carpal tunnel syndrome is a prescribed disease - only for the use of hand-held vibrating tools.

It is unclear whether the disorder is a consequence of the **vibration** or the **posture** and **grip** required to use such tools.

Other factors associated with carpal tunnel syndrome are: various hormonal non-occupational factors including female sex, pregnancy, oral contraceptive use, bilateral oophorectomy, diabetes mellitus and rheumatoid arthritis.

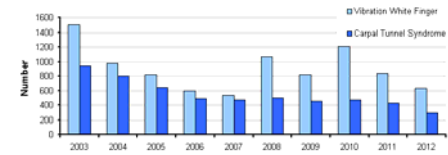
Prescription for carpal tunnel syndrome  
- Recommendation of the IAC- July 2006

Carpal tunnel syndrome is recommended by the Industrial Injuries Advisory Council for prescription for two types of job:

(a) The use, at the time the symptoms first develop, of hand-held powered tools whose internal parts vibrate so as to transmit that vibration to the hand, but excluding those which are solely powered by hand; or

(b) Repeated palmar flexion and dorsiflexion of the wrist for at least 20 hours per week in those who have undertaken such work for at least 12 months in aggregate in the 24 months prior to the onset of symptoms.

New cases of Prescribed Vibration-induced White (VWF) and Carpal Tunnel Syndrome (CTS) in Great Britain 2003 - 2012



Vibration-induced white finger (VWF) is the most commonly prescribed disease under the Industrial Injuries Disability Benefit scheme for the last 10 years. However the number of new cases of VWF has fallen over that period.

# Hand-arm vibration syndrome

Presenter: Michael J Griffin