## What is RSI?

The UK loses about 6 billion pounds in lost production each year due to work related musculoskeletal injuries.
Many of these are preventable.

There are a number of reasons why routine appraisal of your employees physical state and the state of their workstations has significant benefits for us alls:

·        Remedial actions can improve comfort and therefore improve productivity

·        Opportunity to influence behaviours and promote safe working practices

·        Education empowers individuals to improve their workplace hazards and habits

·        Early identification of symptoms may help reduce long term cumulative damage

## Repetitive Strain Injury

is a general term used to describe a primary cause of a condition. It can also indicate an aggravating factor of a pre-existing condition. It simply refers to the repeated use of particular muscle groups as causative and/or aggravating factors.

Most often it is used to classify conditions related to computer work. It also includes most commonly writing with pen/pencil, activities involving prolonged periods of gripping, playing musical instruments, typing and mousing.

WRULD or Work Related Upper Limb Disorders is a term coined by the TUC   (the British Trades Union Council) meaning repetitive strain induced by one's employment. This term includes conditions such as 'beat hand', 'white finger syndrome' and various other work related syndromes.

The principle is simple. For example if I were to stroke my cats' chin with my index finger once, there would be no problem, but if I were to do this one thousand times in an hour, both my index finger tendons and my cat would complain bitterly. The muscles and tendons effecting the movement would become tired and begin to ache. They should recover soon. But if I were then to perform the same activity each day for a week, I would probably find that I could only repeat it a few times before my muscles would feel tired and achy, plus, my cat, now with a bald chin, would not be too pleased.

Thus, any action repeated too many times, no matter how light, will produce a repetitive strain. 'Nintendo and Blackberry thumb' are classic examples.

## The RSI maps

As a result of many years of observation of RSI patterns of pain I have produced the ‘RSI maps’. These maps indicate the specific areas most likely to be afflicted. They enable me to interpret online and offline the areas involved and the related hand/wrist/finger functions specific to those areas. This then enables me to make recommendations regarding habits and when combined with the online or ‘live’ case history enables me to evaluate the nature and severity of the condition.

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| --- | --- | --- | --- |
| IMG_256 | IMG_257 | IMG_258 | IMG_259 |
| Arm and shoulder | Palm and back of hand |

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| --- | --- | --- | --- |
| IMG_260 | IMG_261 | IMG_262 | IMG_263 |
| IMG_264 | IMG_265 | IMG_266 | IMG_267 |
| Flexor and extensor muscles  |

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| --- | --- | --- |
| IMG_268 | IMG_269 |   Common areas of pins and needles and numbness. |

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## RSI pathophysiology

I too have suffered many repetitive strain injuries as a result of the hands-on work that I do in clinic. Intense guitar playing and ‘mousing’ my PC for hours creating many websites don’t help either. However, such episodes have served to edify me with regard to the general and specific nature of  finger, wrist, arm, shoulder, neck and upper ribcage interactions. Said interactions manifest via lines of tension, nerve pain, pins and needles, muscle ache and joint ache by virtue of a sequence of shortening of adjacent structures in response to habit and irritation. 

I have found that the majority of  symptoms arise from the deep muscles, however, often the tendons of the superficial muscles are irritated as they pass over areas where the carpal bones, for example, are misaligned and or inflamed.

When the deep ‘stabilising’ muscles of the forearm become hypertonic or overly tense they lose Oxygen and rapidly tire, causing pain. This reaction in the deep muscles is more likely than with  the superficial layers due to the type of reflex tone setting mechanism and because of restriction to their expansion. The girth of the deep muscles is more tightly constrained than the superficial muscles. This physical constraint to expansion is due to the membranous sheath which envelopes every skeletal muscle of the body. Described as a 'stout' membrane, the epimysium is a layer of connective tissue which ensheaths the entire muscle. It is composed of dense connective tissue and is continuous with the fascia of adjacent muscles and the internal connective tissue wrappings within the muscles.

The density of this sheath varies from deep to superficial muscle layers. Thus, when the deep muscles expand through constant and also unique occasions of overuse they become constrained by the limits of the dense membranes enveloping them. When this state of hypertonus has persisted for some time the nervous system registers the increased tone as normal and automatically maintains the tension even though it is no longer appropriate. Pain will be generally perceived at the anchor points of the muscles and their tendons i.e. the elbow and upper forearm, and the fingers and wrist.



Often I have observed that the superficial layers are weak and flaccid whilst the deep layers are very dense and shortened. Observation of  top professional pianists demonstrates that the relaxed, flowing approach to playing, honed by many years of skill acquisition and the relative absence of  poor postural and technique habits plus familiarity with their own repertoire serves to maximise their performance abilities. However, even these performers can be struck down by injuries such as falls on to the hand, gardening, decorating, writing, carrying heavy bags, and a host of other trauma.

The Carpal bones form a cute little paired arch which sit, tightly bound together. They can suffer from what might best be described as 'displacement'. Some of the Carpal bones can slip slightly out of line with their neighbours. Adhesions which make the Carpal bones glue together are common, usually as the result of a fall or twist strain. The Carpals which are stuck will no longer function in their required movement ranges. These 'displacements' are frequently painful. These can be inflammed in very specific areas and very persistent unless corrected by accurate joint articulation and manipulation. Of course such carpal lesions become painful to type and mouse, write or open a door, thus contributing at a foundation level to the RSI that the individual then suffers.

## RSI treatment

The experienced hand sees by touch, the shapes, densities, heat, textures, resistances of the body, the trained mind puts it all together. The trained hand stretches and softens the specific muscles, tendons and joints as mentioned above, the experienced mind asks questions pertinent to usage and the particular trigger areas under investigation. These can reveal additional information about any other activities that the RSI suffer is engaging in which might be adding an additional trigger area.

Whilst 'weakness' in the muscles' is much ballyhooed, it is more usually the best procedure to save strengthening exercises until the last, once the deep muscles and joint problems have been corrected. The action of correcting a muscle will induce muscle growth anyway. It is often wise to tone up the secondary muscles involved in a given action. Typing, for example, has the Deltoid muscles of the shoulder as secondary stabilisers holding the arms slightly out from the body. If you strengthen these muscles the arm will feel lighter. If the Deltoids are too underused then the deep primary stabiliser, Supraspinatus will become hypertonic and will constitute another trigger area.

When I began many years ago, I took it all for granted. Having been brought up as a boy in an Osteopathic environment I didn't realise that there were many things that people didn't know about in connection with the workings of the body and what makes them function that I took for granted. Hence, trying to take the thorny subject of RSI and shake some common sense into it for you.

Sure, there are other factors potentially involved. Psychological elements, metabolic factors, ergonomic, posture, hydration levels, diabetes, addictions, hypoxia, hypercalcemia, even pollution levels, but here I have restricted myself to those things that seem to be least understood by sufferers. I hope it helps you to understand more deeply the whole painful subject of RSI.

## RSI: neural involvement

If there is a tendency for nerve compression, especially involving the Median nerve, there are specific points where nerve compression can occur, They are as follows:

·        Lower cervical lesions can affect any nerve, i.e. Radial, Ulnar but principally the Median nerve. Symptoms of pain are usually confined to the Radial nerve which tends to radiate pain down the back of the arm and produces numbness on the back of the hands. The Ulnar nerve will produce pins and needles and numbness of the outside of the hand, little and ring fingers and side of palm. Such lesions when severe produce symptoms which are constant

·        1st, 2nd and 3rd rib lesions- elevates and compresses the Brachial plexus. Principally affects the Median nerve. Not usually painful producing pins and needles and occasional numbness in the palm side of the thumb, index fingertip, middle fingertip and sometimes the tip of the ring finger

·        Brachialis in the 'crook of the elbow' can further compress the Median nerve. A sign of Brachialis hypertonus is an inability or difficulty in straightening the arm at the elbow. This gives the three finger tip pattern of Median nerve symptoms

·        Palmaris Longus when hypertonic pulls its fanlike attachments to the palm in will induce Median nerve compression, often in only the index and middle fingers, this is often mis-diagnosed as carpal tunnel syndrome

·        The thumb muscles will produce compression principally of the Median nerve supply to the thumb

·        The tendons and muscles of the index finger and thumb which produce 'pincer' type movements, when hypertonic, make numbness in the thumb and index fingers more likely

·        The carpal tunnel can produce compression of the ulnar nerve when the structures passing through it are thickened, inflamed or suffering from a carpal bone displacement

The thing to realise with trigger areas is that every point of compression you have adds to the tendency to produce both musculo-skeletal pain and pins and needles/numbness. It works like an 'amplifying' process. Each sections' tension pattern adding to its neighbours' along the same nerve pathway. It is a process of attenuation of the nerve signalling, whereby the entire nerve becomes more excitable, thus making subliminal pain spring into consciousness manifesting as a symptom. This overall excitability affects the excitability of the reflexes and thereby the tone of the muscles involved in the highest activity rate rises and tension mounts. You know how it is when someone presses your shoulders and finds places of tension that you didn't realise were there. These areas of hypertonicity are generally not needed by the body, unless you are a lumberjack!! The point being that we are all on the verge of  being in pain all the time in many places of our body its just that our nervous system cleverly 'damps' it down so that we don't suffer too much.



## RSI: muscle and tendon involvement

Why do some people get RSI from a particular activity whilst others performing the same activity are seemingly immune?

From my observations it would appear that the main factors in giving an increased likelihood for RSI fall into the following categories:

* Musculo-skeletal
* Neural encroachment and compression
* Amount of time pent performing activities
* Intensity of actions required

Musculo-skeletal factors consist of the shortening and tightening of any or all of the following trigger areas:

·  Lower Cervical deep spinal muscles and Osteopathic lesions in the neck and upper ribcage areas

·  Upper ribcage lesions, most commonly where ribs 1 to 3 are stuck in an elevated position. This commonly exists along with deep tension in the upper fibres of Trapezius, the intercostal muscles and spinal muscles overlying the upper dorsal spine

·  Tension patterns in the rotator cuff muscles, principally Teres major and minor, Infraspinatus, Subscapularis, Supraspinatus and Pectoralis Minor

·  The deep fibres of Biceps with occasional involvement of Brachialis

·  The superficial and deep flexors of the wrist and fingers and thumb which lie on the palm side of the forearm

·  The deep fibres of Brachioradialis

·  The deep extensors of the wrist and fingers which lie on the back of the forearm

·  The deep and superficial palm and finger flexors in the hand

All of these areas must be examined thoroughly for any hypertonus (tension) and deficient ranges of movement where the joints are involved.

The trained hand will know precisely where these areas are and then with the right skills, 'undo' them. The skills needed are primarily the educated sense of touch, like a potter or pianist, and then the techniques to do something about what you find.

The most commonly involved trigger areas are in the deep extensors and flexors of the wrist and fingers as well as the muscles of the Thenar eminence (thumb). This is most evident in cases where the use of a mouse and typing have over-tightened the deep extensor tendons, the deep flexor tendons and the thumb muscles. These, in order of appearance constitute the basic building block of RSI of the forearm and hands.

When you add in the all too common shoulder and neck tension patterns, you will become very likely to suffer from RSI.

## Psychological factors:

Fear is the main factor. Fear is bred by uncertainty. People react very differently to uncertainty, ranging from the ‘head in the sand’ approach to the screaming Banshee approach, from the stoic masochist to the suicidal maniac. This is when it is vital that the employee knows as much as possible about their condition, its causes, cures and above all, its prognosis.  This where my sort of expertise comes into its own. I have found that the very act of filling my public RSI survey has resulted in people realising not only their bad habits but also being able to identify very specific areas of their anatomy and understanding why it is in pain.  Knowledge is power, power negates anxiety.

So pay attention to your body, give it the respect it deserves.

## How to avoid RSI:

1. Use varied means of communicating with your computer, keyboard shortcuts, pen tablets, voice recognition.

2. Do not use the scrollwheel on your mouse, this will give pain along the top of the forearm (see below).



3. Don't grip the  mouse when you don't have to.

4. Do not hold the hands pointing up or the extensors will become tired and achey: (in green above)

5. Stretch the hand and forearm tendons regularly.

6. Vitamin and mineral supplements are useful depending on the lack of these elements in the individual. Vitamin B12 and Magnesium can be very useful for the ‘run down’ and crampy person. Certain muscle building dietary supplements can help to build muscle where a person has poor muscle development.

7. General exercise such as cardiovascular exercises stimulates blood flow to the whole body and is therefore beneficial to all the muscles.

8. Air conditioning drafts should be avoided for those of us who are sensitive to such things, cold air will make the highly temperature sensitive muscles of the neck and the deep muscles of the forearm contract in tension.

9. Hydration. Without water we would all be dead in three days. Water is the largest element of muscle, and is fundamental to all functions of the body. An adult should consume around 1.5 litres per day.

10. Sleep is one of the most important factor of all in recovery. It is more than mere rest, it rebuilds us nightly and is to be greatly respected.

11. Experiment with different mouse types and sizes. Always use a laser, wireless mouse.

12. Avoid texting, gaming and emailing by phone.

13. Arms on chairs should be used. The desk design should not such that it prevents the operator from getting close enough to their desk. Ideally one should be able, with the base of the spine touching the back of your seat, to get close enough under the desk to touch your belly to the desk edge. Too many desks don’t allow for this. If this is the case, the operator will be forced to sit forwards on the edge of their chair. This is very bad for posture and circulation to the legs.

14. Footrests for the vertically challenged are vital.

15. Monitors should be placed so that the operators natural eye-line falls near to the top of the screen. The screen should be angled slightly back at the top so that it is more parallel with the operators face-line.

## In conclusion:

Whilst a small number of RSI problems can be chronic, the majority are relatively easy to avoid and to correct using a precise diagnosis and examination of the structures involved.

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