





Ergonomics and Repetitive Strain Injury (RSI)

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Ergonomics




Ergonomics

- Greek
- Ergo – work
- Nomos – rules, natural laws
- *Ergonomics is the laws of work that define the limits to human capability.*



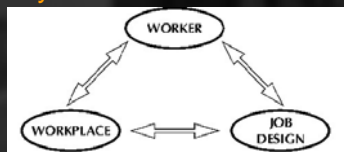
Development of Ergonomics

- As early as 18th century, doctors noted that workers who were required to maintain body positions for long periods of time developed musculoskeletal problems.
- Within last 20 years, research has clearly established connections between certain job tasks and RSI or other musculoskeletal disorders.



Ergonomics

- The study of job design in relation to the workplace and the workers.
- To determine how the workplace can be designed or adapted to the worker in order to prevent a variety of health problems and to increase efficiency.



Benefits of Ergonomics

- Increase in Productivity
- Increase in Quality
- Increase in Employee Morale
- Decrease in Absenteeism
- Decrease in RSI



Repetitive Strain Injury (RSI)



Synonyms of RSI

- Cumulative Trauma Disorder
- Repetitive Motion Injury
- Occupational Overwork Syndrome
- Musculoskeletal Disorders



Repetitive Strain Injury

- Trigger finger
- Sprain ankle
- Golfer's elbow
- Fracture proximal finger
- Mallet finger
- Carpal tunnel syndrome
- Tennis elbow

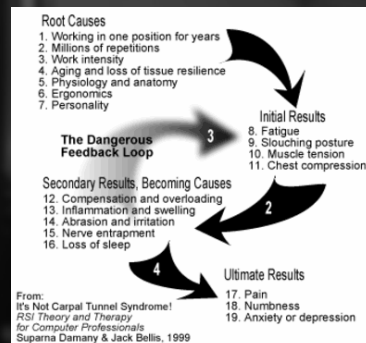


What is RSI?

- Repetitive Strain Injury (RSI)
 - is pain or nerve problems in upper extremity (hands, arms, or shoulders)
 - can also include neck and back
 - is a soft tissue disease (muscles and nerves)
 - is an overuse syndrome



Etiology of RSI



Etiology of RSI



- Controversial:
 - Many deny it exists.
 - Sufferers receive little support from employers.
- Diagnosis is often a difficult proposition.

RSI Leads to.....



- Frequent rest breaks
- Decreased production rates and poor quality
- High absenteeism and a high turnover of employees
- High rate of material waste
- Low morale

Cost of RSI



- Over 700,000 RSIs occur every year in US.
- Cost per injury = US\$7000-\$30,000.
- Cost per year: over 20 billion dollars.
- Median of lost time per injury is 18 days.

Cost on Workers



- Direct
 - the pain and suffering of the illness.
 - the loss of income.
 - the possible loss of a job.
 - health-care costs.
- Indirect
 - human suffering caused to workers and workers' families.

Cost on Workers



Direct : Indirect
1 : 4 to 10

Cost on Employers



- Direct
 - payment for work not performed.
 - medical and compensation payments.
 - reduction or a temporary halt in production.
 - increased training expenses and administration costs.
 - possible reduction in the quality of work.
 - negative effect on morale in other workers.
- Indirect
 - the injured / ill worker has to be replaced.
 - a new worker has to be trained and given time to adjust.
 - it takes time before the new worker is producing at the rate of the original worker.
 - time must be devoted to obligatory investigations, to the writing of reports and filling out of forms.
 - accidents often arouse the concern of fellow workers and influence labour relations in a negative way.
 - poor health and safety conditions in the workplace can also result in poor public relations.

Cost on Insurance Companies



- Sick Leave Pay
 - 80% of normal monthly earnings
- Medical Expenses
 - \$200 for in-patient treatment or out-patient treatment
 - \$280 for both treatment on the same day
- Lump Sum Compensation
 - Based on loss of earning capacity

Labour Department, 2009

Occupational Diseases



- Those having a specific or strong relationship with exposure to physical, chemical, biological or psychosocial factors at work, and these environmental factors are the predominant causes of such diseases.
- Listed in Appendix 2 of Second Schedule of the Employee's Compensation Ordinance.

Labour Department, 2009

Occupational Disease



- A – Caused by Physical Agents
- B – Caused by Biological Agents
- C – Caused by Chemical Agents
- D – Caused by Miscellaneous Agents

Labour Department, 2008

Occupational Disease Caused by Physical Agents



- A8 – Traumatic inflammation of the tendons of the hand or forearm (including elbow), or of the associated tendon sheaths
 - Tennis Elbow
 - Golfer's Elbow
 - Tenosynovitis
 - Trigger Finger
 - De Quervain Syndrome
- A9 – Carpal Tunnel Syndrome

Labour Department, 2009

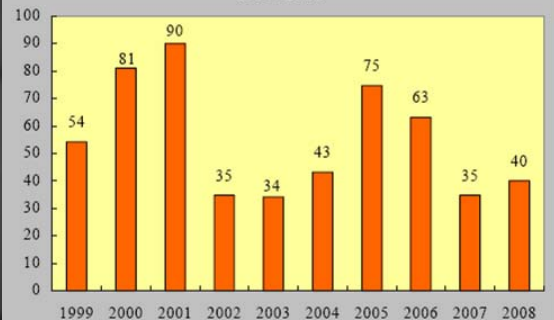
Occupational Disease Statistics



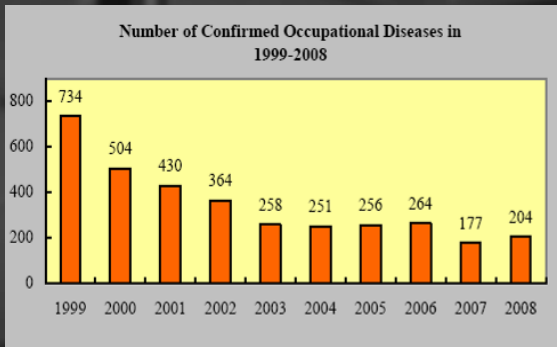
Occupational Diseases	2007	2008
A8 : Tenosynovitis of Hand or Forearm	13	40
A9 : Carpal tunnel syndrome	0	0

Labour Department, 2009

Number of Tenosynovitis of Hand or Forearm in 1999-2008



Labour Department, 2009



Labour Department, 2009



Incidence

- Occupational diseases generally develop gradually over the years but actually kill more workers annually than 'accidents'. However, 'accidents' are visible and receive attention but disease victims are completely forgotten.

Asia Monitor Resource Centre, 2010



Incidence

- Some occupational diseases have been recognized for many years and affect workers in different ways. Such diseases are still problems in all parts of the world.
- Several countries report RSI incidence of 5-10%, although this could be as high as 40% in specific working populations.

ILO, 2010



Incidence

- The numbers of work-related diseases in developing countries are much higher in reality than the numbers that are reported.
- The numbers of cases and types of occupational diseases are increasing in both developing and industrialized countries.

ILO, 2010



Cause of Low Incidence


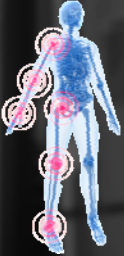
- Inadequate or non-existent reporting mechanisms.
- A lack of occupational health facilities.
- A lack of health care practitioners who are trained to recognize work-related diseases.

ILO, 2010




Common Symptoms

- Pain, possibly up to a burning sensation.
- Tingling, numbness, or coldness.
- Loss of flexibility.
- Impaired motion or functioning.

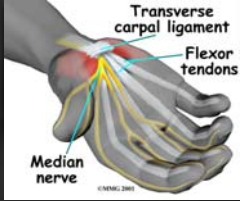



Common Diagnosis



Carpal Tunnel Syndrome

- Median nerve entrapment at the carpal tunnel in the wrist.
- Pain and tenderness in wrist.
- Pain and paraesthesia in fingers especially lateral 3 fingers.
- Recognized by Phalen's maneuver.





Cubital Tunnel Syndrome

- Ulnar nerve entrapment at the cubital tunnel in the elbow.
- Loss of sensation, numbness, tingling, muscle atrophy of ring and little fingers.






Guyon's Canal Syndrome

- Ulnar nerve entrapment at the ulnar tunnel in the wrist.
- Numbness in ring and little finger.
- Often occurs simultaneously with cubital tunnel syndrome.

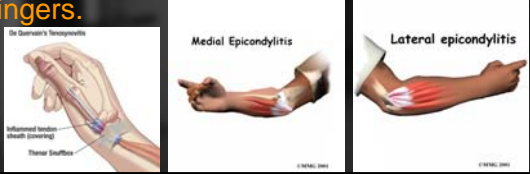
Radial Tunnel Syndrome

- Radial nerve entrapment in the elbow.
- Pain on both sides of forearm.
- Loss of finger strength.
- Hard to make twisting motions.
- Often misdiagnosed as tennis elbow.

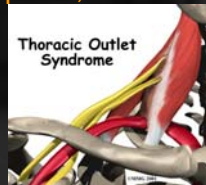
Tendinitis and Epicondylitis

- Inflammation of the tendon and/or insertion.
- Pain and tenderness at the tendon and/or insertion.
- Can occur in forearms, elbow, shoulder, or fingers.



Thoracic Outlet Syndrome

- Constriction of the blood vessels and/or nerves at the thoracic outlet.
- General pain all through the upper and forearms.
- Possibly positive in Hands-up test, Adson's sign and Costoclavicular Maneuver.



Trigger Finger

- Characterized by catching, snapping or locking of the involved finger flexor tendon, associated with dysfunction and pain.
- A nodule forms on the tendon which forms a disparity in size between the flexor tendon and the surrounding retinacular pulley system.



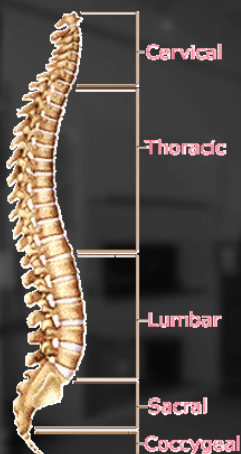
Causes of RSI

$$\text{RSI} = \begin{matrix} \text{High} & \text{High} & \text{High} \\ \text{Force} & + \text{Repetition} & + \text{Speed} \\ \\ \text{+ Long} & \text{Poor} & \text{No} \\ \text{+ Duration} & + \text{Posture} & + \text{Rest} \end{matrix}$$

Postures Affecting Handgrip

Wrist Postures	% of Power Grip
Neutral	100
25° radial deviation	80
45° extension	75
45° ulnar deviation	75
45° flexion	60
60° flexion	45

Rodgers, 1987



Poor Postures



Slouching



Wrist pronation



Wrist ulnar deviation



Wrist extension



Management of RSI

Physiotherapy

- Pain Control
 - RICE
 - Physical modalities
 - US, IFT, hot and cold, TENS
 - Postural correction
- Stretching
- Strengthening
- Work conditioning



Other Medical Treatment

- Splint
- Medication
- Cortisone injection
- Surgery



Prevention of RSI



Causes of RSI

$$\text{RSI} = \text{Force} + \text{Repetition} + \text{Speed} + \text{Duration} + \text{Posture} + \text{Rest}$$

The equation above is crossed out with large red 'X' marks over each term, indicating that these factors are not the causes of RSI.



Prevention of RSI

- Reduce the force required
- Reduce the number of repetitions
- Reduce the pace of work
- Increase number of breaks from repetitive work.
- Eliminate awkward postures and risk factors from the job
- Moves the worker to other work, or by alternating repetitive tasks with non-repetitive tasks at regular intervals



Ergonomic Evaluation



Workstation Risk Assessment Checklist

- Used for working with Display Screen Equipment (DSE).
- Where the answer is "Yes" or the question is not applicable, no follow-up action is required.
- Where the answer is "No", follow-up actions will be needed to reduce the risks. Any follow-up action to be taken should be recorded in Part B of the checklist.

Labour Department, 2003



Annex Workstation Risk Assessment Checklist

Name of organization: _____
 Address: _____
 Workstation location: _____
 Name of user: _____
 Description of task: _____

Part A - Assessment		Yes	No	N.A.*	Remarks
Display Screen					
1.	Does the screen give a clear, sharp and steady image?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.	Are the characters readable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.	Are the brightness and contrast adjustable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.	Does the screen swivel and tilt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5.	Is the screen positioned at about or slightly below the eye level and in front of the user?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6.	Is the screen free from reflectors and glare?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Input Devices (Keyboard, mouse, numeric pad, etc.)					
7.	Is the keyboard tiltable and detached from the display screen? (Not applicable to portable systems)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8.	Are the characters on the keys of the keyboard/numeric pad readable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9.	Is the keyboard/numeric pad glare free?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10.	Are the input devices positioned at about the elbow level?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11.	Is there enough space to rest hands in front of the input devices?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Work Desk					
12.	Is the desk surface large enough for the screens, input devices and documents?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13.	Is there adequate leg-room below the desk?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



Annex Workstation Risk Assessment Checklist

		Yes	No	N.A.*	Remarks
Chair					
14.	Is the base of the chair stable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15.	Do the casters allow easy movement of the chair?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16.	Is the seat height adjustable to suit the body size of the user?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17.	Is the backrest adjustable in both height and tilt to provide adequate support to the lower back?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18.	Is the seat pan padded and free from sharp edges?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19.	Do the armrests, if any, allow the user to get close enough to key comfortably?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Document Holder					
20.	Is the document holder, if provided, properly positioned to avoid awkward neck posture and movement?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Footrest					
21.	Is the footrest, if required, stable and provided with a non-slip surface?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Illumination					
22.	Is the lighting level suitable for the work?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Note					
23.	Is the noise produced by the workstation acceptable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Part B - Follow-up Actions
 (If a "No" answer is given to any of the above questions, follow-up actions are required.)

Person making the assessment: _____ Date of assessment: _____
 Name: _____ Title: _____



Quick Check Risk Factor List Checklist



- Crude method for estimating the risk of developing RSI from performing a specific task.
- Each repetitive task is scored separately.
- The score is additive for another repetitive task.
- If > 10, further ergonomic study is needed.

Quick Check Risk Factor List Checklist (ASC Z365, March 27, 1998)

RISK FACTOR	<1hr	1-4hr	4hr>
REPETITIVE			
Every few seconds	0	1	3
Every Few Minutes	0	0	1
LOAD FORCE (lift)			
5-15 lbs	0	0	1
15-30	1	1	2
30-50	2	2	3
>50 lbs@	3	3	3
LOAD/FORCE (Push/Pull)			
Easy	0	0	1
Moderate	0	1	2
Heavy	1	2	3
LOAD/FORCE (Carry > 10 ft)			
5-15 lbs	0	0	1
15-30	0	1	2
>30	1	2	3
AWKWARD POSTURES			
Neck/Shoulder: Overhead/Bend	0	1	2
Extended Reach	0	1	2
Elbow/forearm: Twist	0	1	2
Hand/Wrist: Bend/Pinch	0	1	2
Trunk: Twist/Bend	0	1	2
USE POWER TOOLS	0	1	2
PRESSURE POINTS	0	1	2
SAME POSITION	0	1	2
ENVIRONMENT	0	1	2
Cold/Hot/Light/Glare/Vibration	0	1	2
CONTINUOUS KEYBOARD USE	0	1	2
INCENTIVE WORK or NO WORKER CONTROL OVER JOB PACE	0	1	2

TOTAL SCORE = 10 or more?

@Single Lift > 50 lbs increases risk of low back problems.



Message to Bring Home



Question & Answer



Thank You!!!

