

Upper Extremity Work-Related Musculoskeletal Disorders

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Outline of presentation

- The scope of the problem
- Nature of work-related MSD
- Clinical assessment
- Return to work (RTW)

Work-related musculoskeletal disorders

-WMSD-

- UE work-related injuries → will not be discussed
 - relatively easy to attribute cause
- WMSD = Relates to MSK pain or symptoms that someone has attributed to activity at work
 - Subacute, gradual, insidious onset

Scope of problem

Upper extremity
work-related musculoskeletal disorder
(UE WMSD)

**% Prevalence of RSI for Canadian
population household survey
(20 years or older)**

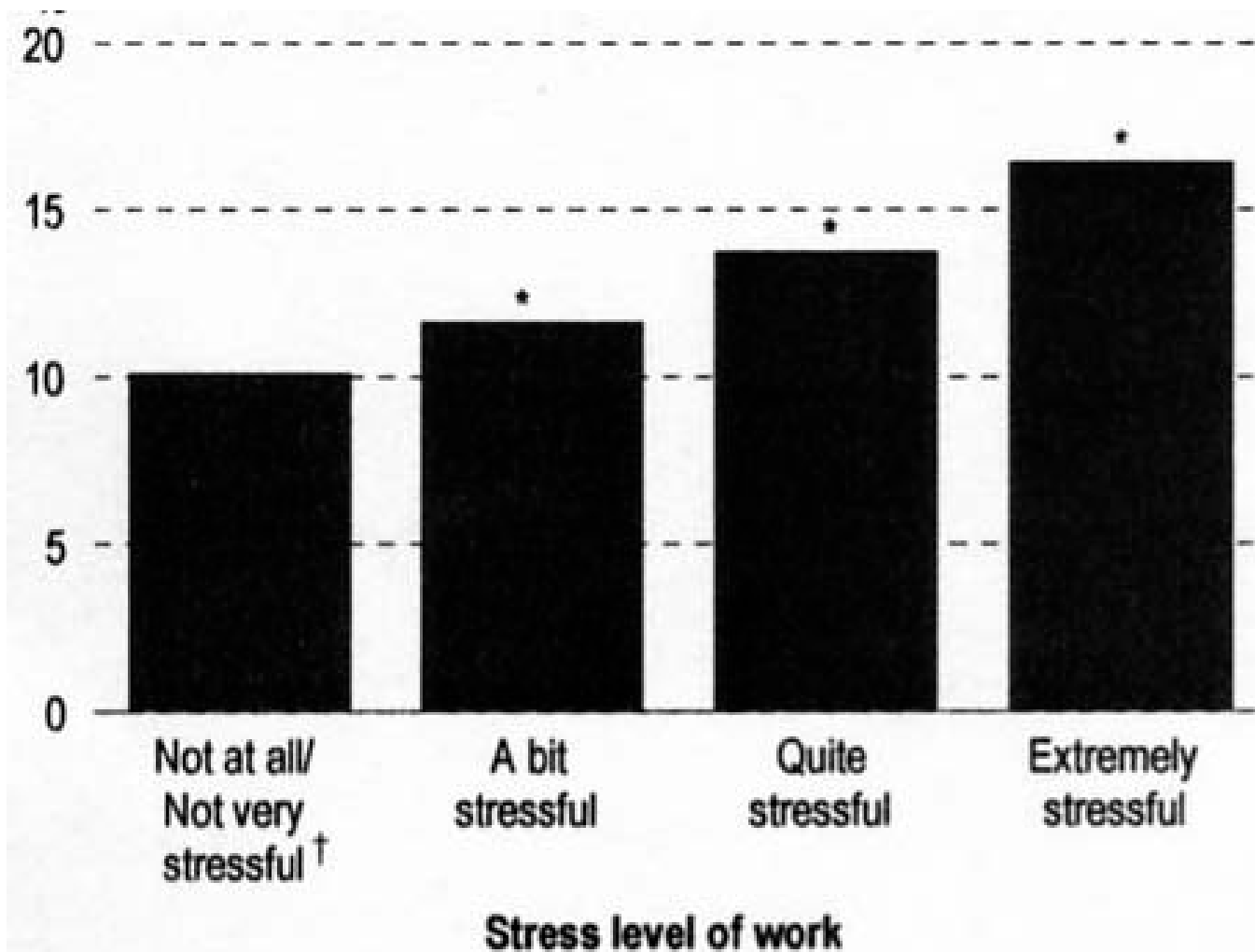
	Both sexes	Men	Women
1996/97	8.0	8.2	7.9
1998/99	9.4	9.6	9.3
2000/01	10.1	9.9	10.3

→ 63% involve the UE

Reported activity associated with RSI in population survey 2000-2001

	Both sexes		Men		Women	
	'000	%	'000	%	'000	%
Total	2,283	100.0	1,098	100.0	1,185	100.0
Working	1,233	54.6	620	57.1	613	52.3
Sport/Physical exercise	446	19.7	275	25.3	171	14.6
Chores/Unpaid work/ Education	317	14.0	94	8.7	222	19.0
Leisure/Hobby	142	6.3	63	5.8	79	6.8

RSI prevalence according to stress level reported in 2000-2001 survey



2007 number of accepted time-loss injuries (AWCBC)

- Shoulder (clavicle and scapula) > 22,000
 - Arms > 14,500
 - Wrists > 12,500
 - Hands except finger > 12,500
 - Fingers, and nails > 30,000
 - Multiple UE locations > 3,500
- Total > 95,000**

2007 number of accepted time loss injuries and industry divisions that exceed 1000 cases

	Manufacturing	Construction	Retail	Transportation and storage	Health and social services	Accommodation, food & beverage	Government services
Shoulder	X	X	X	X	X		X
Arms	X	X	X	X	X	X	
Wrists	X	X	X	X	X		
Hands	X	X	X			X	
Fingers	X	X	X	X	X	X	X

Scope of problem

UK survey 1997-2000

- UE 66% of work-related MSK cases
- 85% of these cases were repetitive exposure
→ UE WMSD

(Guest) Estimated cost of UE WMSD in Canada

- Total accepted time loss injuries (2005)
 - ~ 338,000
- Total accepted time loss injuries UE
 - > 95,000
 - 85% are WMSD = 80,000
- Total compensation payments (2005)
 - ~\$7 billion
- Total compensation payments for UE WMSD
 - $(80,000/338,000) \times \$7 \text{ billion} =$

~\$2 billion/ year

Nature of upper extremity WMSD

“The modern plague”

WMSD

- Heterogeneous group of MSK conditions
- MSK pain and symptoms of
 - **muscles**
 - **nerves**
 - **tendons (sheaths)**
 - **ligaments**
- RSI, CTD, RMD, OOS, ASTD
 - Overuse syndrome, chronic overuse injuries

WMSD

Specific conditions

- **Shoulder**
 - rotator cuff tears, impingement, bicipital tendonitis
- **Elbow**
 - lateral epicondylitis, medial epicondylitis, ulnar neuropathy (cubital tunnel syndrome)
- **Forearm**
 - pronator teres syndrome, anterior interosseous nerve syndrome, radial nerve entrapment neuropathy
- **Wrists**
 - carpal tunnel syndrome (CTS), de Quervain's tenosynovitis
- **Hand and fingers**
 - HAVS, trigger fingers

WMSD

Non-specific conditions

- regional arm pain syndromes
 - some local tenderness
 - Vague aches and pain or generalized aching
 - no obvious explanation (diagnosis) for pain
 - associated function loss and disability
- RSI of shoulder, neck-shoulder syndrome, cervicobrachial disorder, forearm or wrist tendonitis (unspecified)

Example of non-specific
presentation

Worker's hand with blotchiness



Secondary RP due to HAVS



Sources of information on MOI/pathogenesis of UE WMSD

- Sports injury models
 - tennis elbow, golfer elbow
- Other professions
 - dancers, musicians
- Some histological samples
 - Cadaver studies
 - Animal studies
- Rare experimental data
- Epidemiologic studies

Primary risk factors

Physical stressor

- Forceful activity
- Posture
 - static, awkward, extreme
- Repetitive activity
- Vibration
- Environmental conditions
 - cold, heat, wet, dry

Basic premise for MOI

Physical stressor



repeated exposure



cumulative incremental damage



ineffective

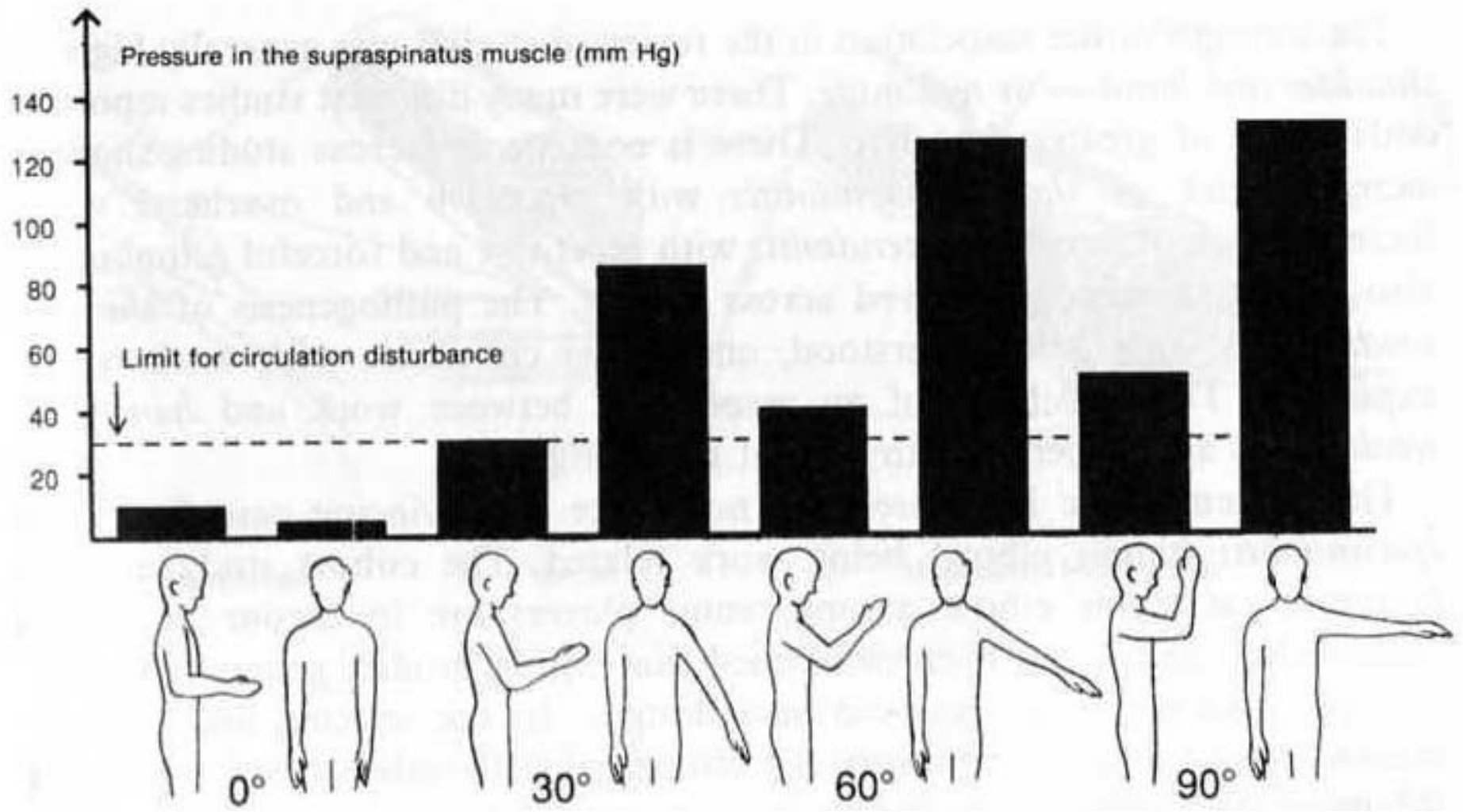
tissue
repair



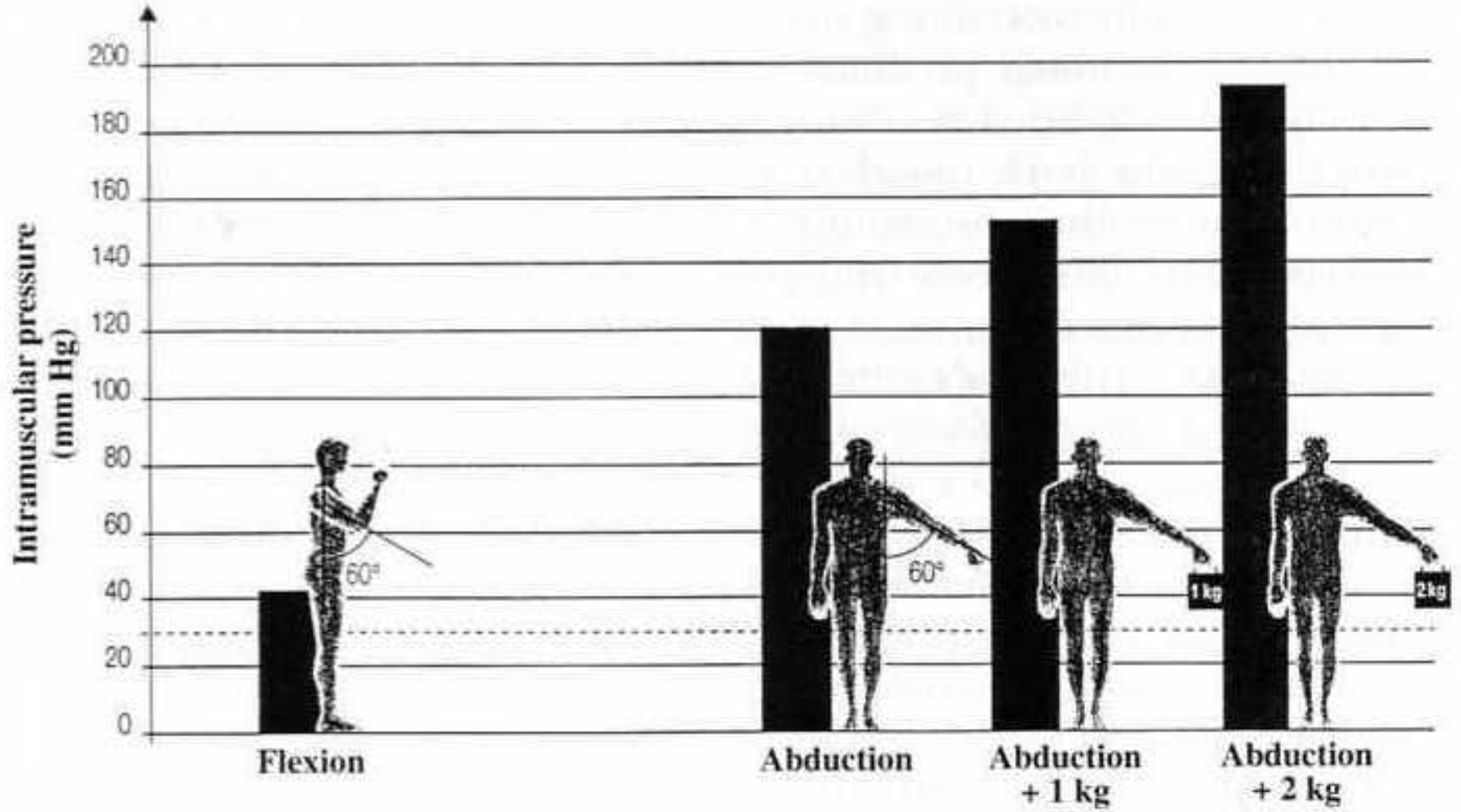
threshold limit



Symptoms



Arm raised 60°



Incomplete knowledge of the pathogenesis of UE WMSD

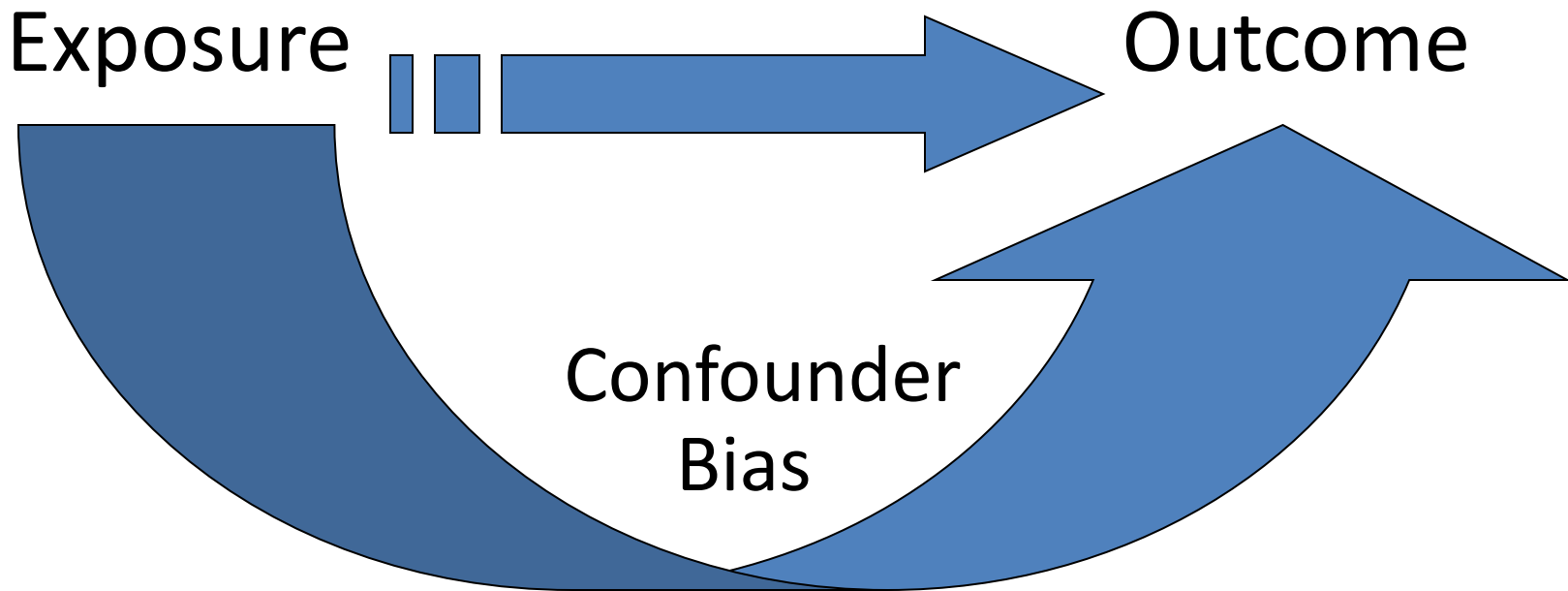
- Especially the less clearly defined entities

MOI/ pathogenesis

= reasoned hypothesis

WMSD Epidemiology

- Evidence of association between work exposures and musculoskeletal disorders



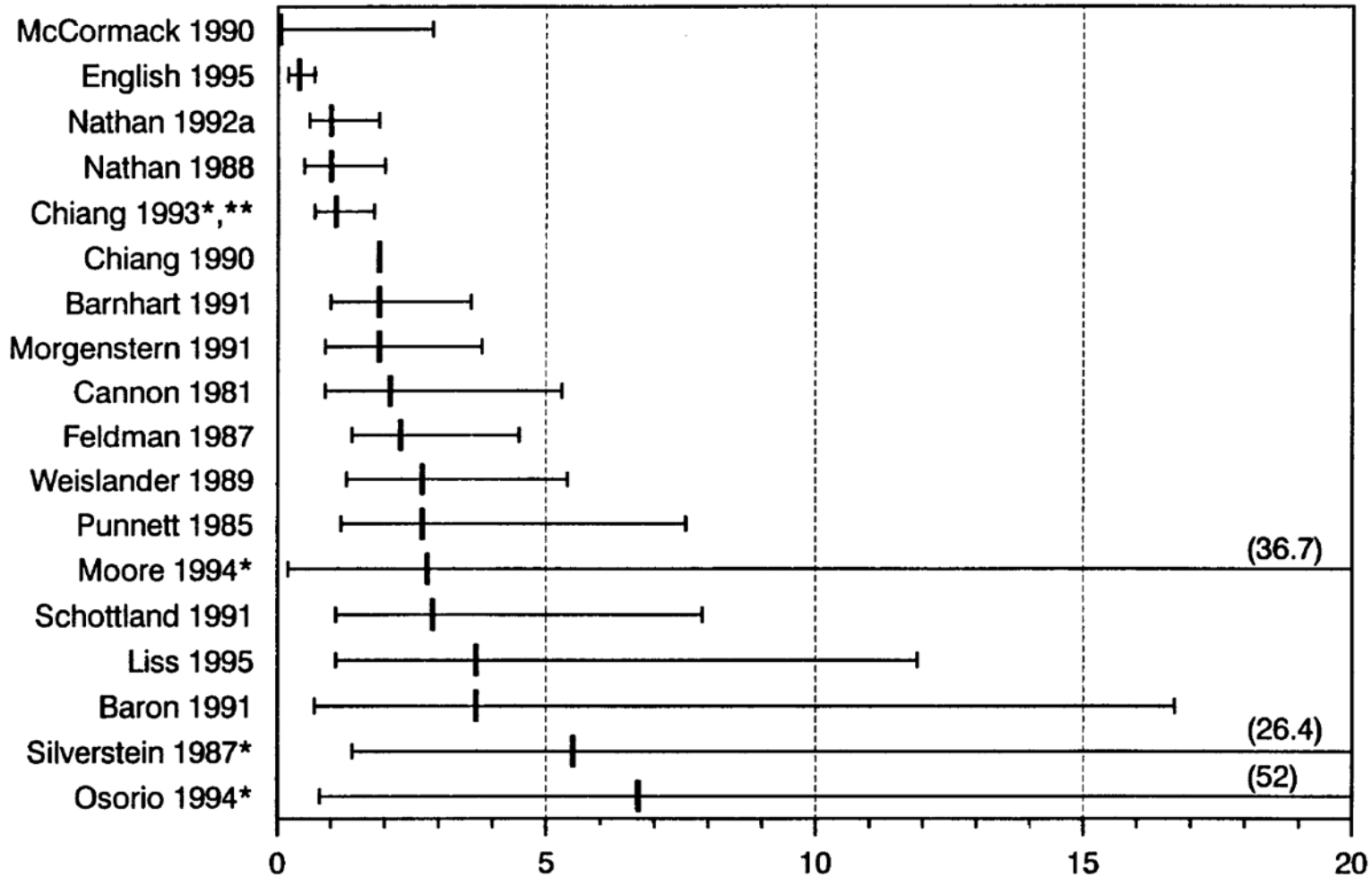
Limitations of Epidemiology of WMSD

- Poor quality studies
- Cross sectional studies rather than analytical studies
- Most studies are qualitative
- Lack of dose-response data (quantitative)
 - Threshold for disease or injury uncertain
- Exposure difficult to evaluate and estimate
 - Worker reported (inaccuracies)
 - Direct observation
 - Direct measurement (most accurate)
- Outcome definition limitations
 - symptom reporting (most misclassification)
 - epidemiological case definitions
 - medical diagnosis (most accurate)

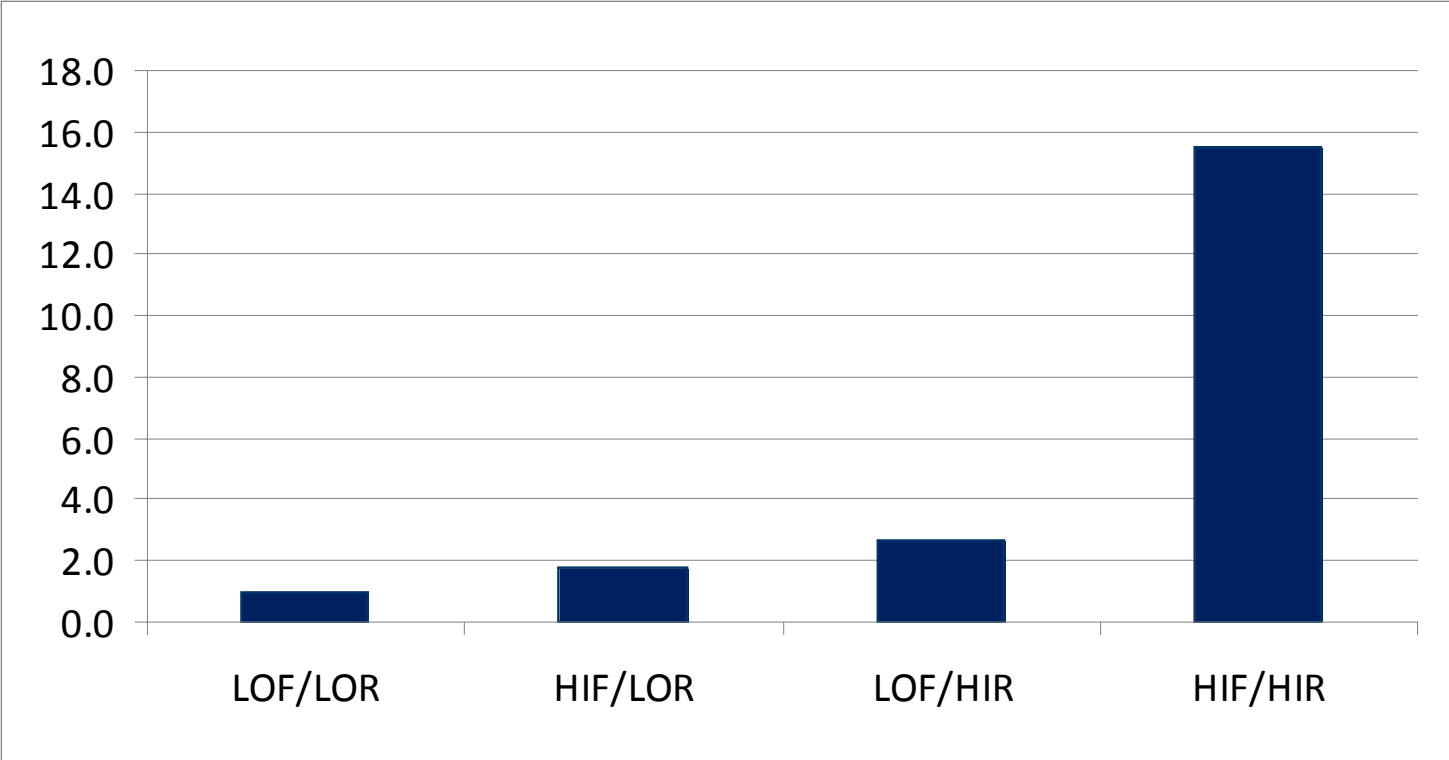
Limitations of epidemiology

e.g. CTS

Risk of CTS and repetitive work



Risk of CTS among industrial workers



Low force =
LOF

High force =
HIF

Low repetition
= LOR

High repetition
= HIR

Some studies → no association

- Women employed outside the home have a lower incidence rate than homemakers
- Lower incidence among keyboard users for CTS
- Strongest risk factors for CTS = weight and BMI
 - related to reconditioning → workers who exercise complain less of CTS

Risk factors identified in epidemiological studies

RTC tendonitis/impingement

- Evidence for highly repetitive work
 - especially when combined with awkward postures
- Evidence for a repeated and sustained shoulder postures $> 60^\circ$ of flexion or abduction
- Insufficient evidence for force or vibration

Epicondylitis

- Evidence for forceful work
- Strong evidence for a combination of risk factors: highly repetitious and force, force and posture
 - use of heavy hand held tools
- Insufficient evidence for repetitive work or postural factors alone
 - E.g. construction workers, meat packers

Hand/wrist tendonitis

- Evidence for repetition, force and posture and hand/wrist tendonitis
- Strong evidence for a combination of risk factors:
 - highly repetitious and forceful hand/wrist extensions
 - E.g. assembly line workers

CTS

- Evidence for a force, vibration, highly repetitive work
- Strong evidence a combination of risk factors e.g. force and repetition, force and posture
- Insufficient evidence for extreme posture
 - E.g. assembly line workers, textile workers, grocery store checkers
- KEYBOARD and MOUSE???

Representative exposure values

(not threshold values)

Hand/wrist/elbow

- High repetition cycle for hand/wrist
 - Cycle repetition ≤ 30 seconds
 - Or $\geq 50\%$ of cycle time performing the same fundamental motions
 - Repetitive movement >2 hours/day
- Force or forceful work or heavy load
 - > 6 kg
 - Handling tools > 1 kg
- Working with vibrating tool > 2 hours per day

Shoulder

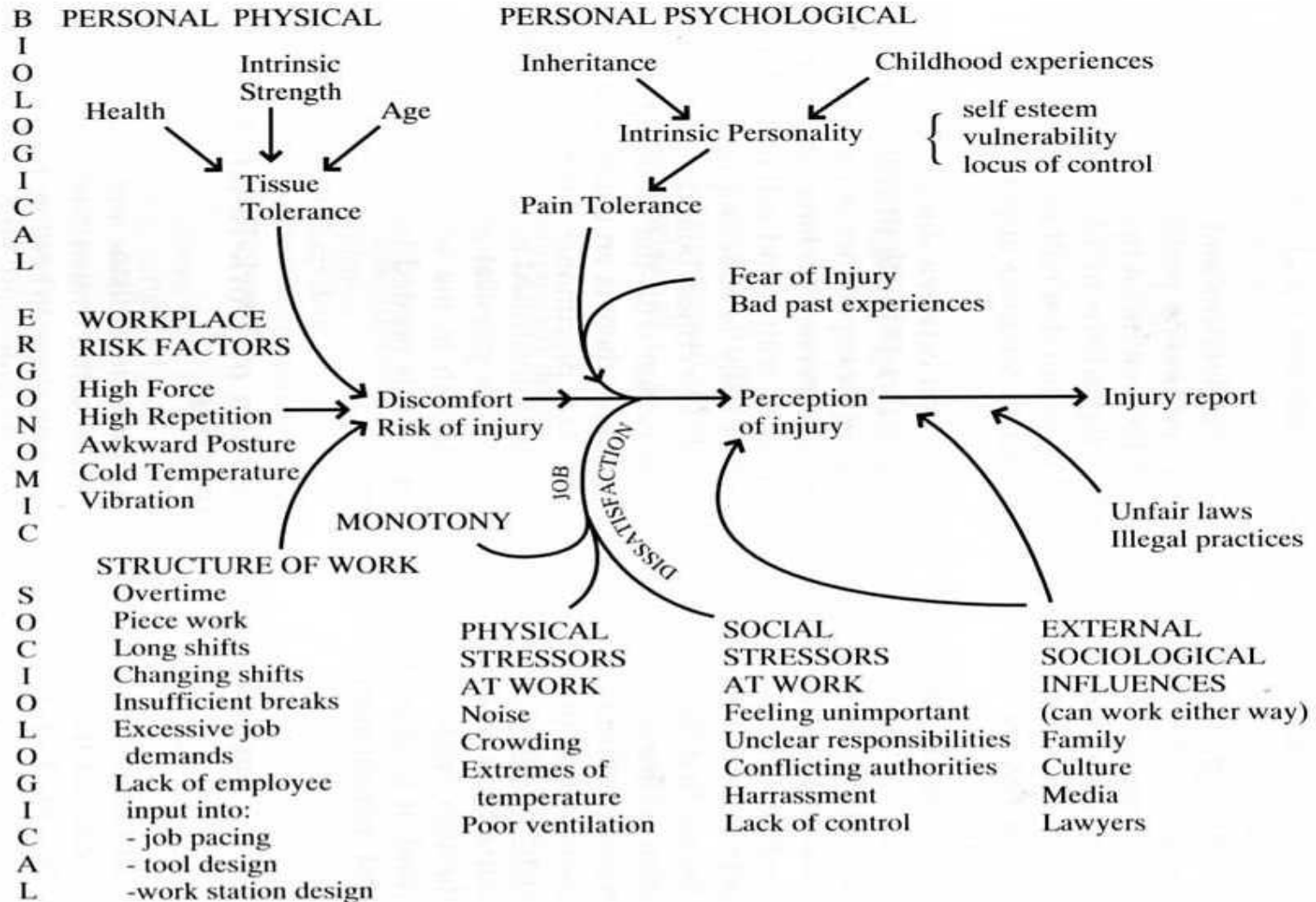
- Repeated or sustained $> 60^\circ$ of flexion or abduction
- Repeated or sustained $> 30^\circ$ of flexion or abduction over horizontal

Psychological factors identified in epidemiological studies

- Intensified workload with increase time pressure (deadlines)
- Monotonous work
- Lack of job control
- Job clarity/ambiguity
- Low level social support
- Job dissatisfaction

WMSD

complex multifactorial problems



Complex interaction of factors

- Physical factors/stressors at work
- Individual factors
- Organizational factors
- Psychosocial factors
- Political factors





The RSI epidemic of Australia

The RSI epidemic of Australia

- In the early 1980s an epidemic of non-specific (or diffuse) arm pain
- Affected a wide spectrum of occupations
- Most jobs had not changed for decades
- Symptoms were associated more commonly with light sedentary work than with heavy work
- More prevalent with less repetitive work

Australian RSI epidemic

“the largest, most costly and most prolonged industrial epidemic in world history”

“misconceptions reinforced by the medical profession, unions, public and the workers compensation system have succeeded in transforming an essentially benign condition into a major public health problem”

Clinical evaluation

Goals

- Specific accurate diagnosis
- Determine work association (if any)
- Best treatment to restore function and return to baseline
- Return to productive life and work

Diagnosis

- History
 - Work history
- PE
- Objective testing
 - biological markers
 - radiologic
 - electrodiagnostic
- Referrals

Test accuracy

CTS tests

Test

Sensitivity

Specificity

Phalen

55%

45%

Tinel

42%

67%

Flick sign (shacking hand)

93%

96%

Durkan's compression test

89%

90%

Night pain

96%

80%

Determine work association

- MOI consistent
- Biological plausibility
- Supportive epidemiologic evidence
 - Is the exposure known to be associated with diagnosis
- Other supportive evidence
 - Workplace exposure measurement
 - Other workers (patients) similarly affected

Post-diagnosis formulation

- Assessment of functional status
- Best treatment options based on evidence based guidelines
- Temporally based expectation for recovery
- Compensation
- RTW
- Prevention from repeat

Holistic approach

- If the diagnosis is non-specific
- If recovery is delayed more than expected or unexplained

Consider psychosocial contribution

- Multidisciplinary team approach:
- psychotherapy
 - Rehabilitation program

RTW

- Problems with failure to RTW early
- Advantages of RTW
- Identify barriers
 - Patient factors
 - Workplace factors

Questions?