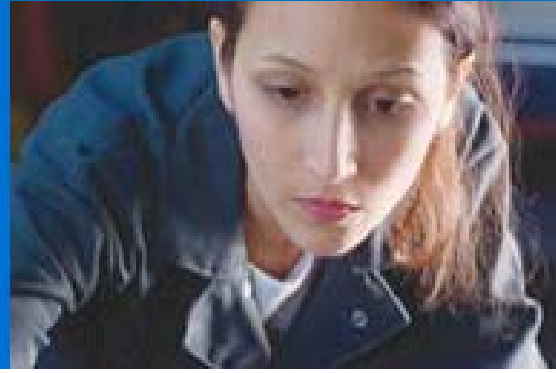
Centre of Research Expertise for the Prevention of Musculoskeletal Disorders (CRE-MSD) presents

REDUCING FATIGUE AND PREVENTING MSDs IN THE WORKPLACE



The Importance of Neuro-Muscular Fatigue at Work

Richard Wells, University of Waterloo

December 4th, 2012 8:30am – 3:30pm

Centre for Health and Safety Innovation (CHSI)
5110 Creekbank Road, Mississauga, Ontario

Registration fee:
Register by November 26th - $75
Register after November 26th - $100

Register online: www.cre-msd.uwaterloo.ca/Fatigue_Conference_2012.aspx

Contact: Betina Butler | bbutler@uwaterloo.ca | 519-888-4567 ext. 35513

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CRE-MSD
Centre of Research Expertise for the Prevention of Musculoskeletal Disorders

The Centre receives funding through a grant provided by the Ontario Ministry of Labour

What is it?

I shall not today attempt further to define hard-core pornography, and perhaps I could never succeed in intelligibly doing so.

But I know it when I see it.

Paraphrased with apologies to Justice Potter Stewart in *Jacobellis v. Ohio*

What is it?

I shall not today attempt further to define hard-core pornography, and perhaps I could never succeed in intelligibly doing so. But I know it when I see it.

fatigue

feel

Paraphrased with apologies to Justice Potter Stewart in *Jacobellis v. Ohio*

Muscio's Paradox

While we do have measures of fatigue, we have no good definition or theory of fatigue so we cannot tell if the measures are valid.

BUT, with no good theory, we can't develop better measures from first principles either!

Definition?

Fatigue

A process leading to the impairment of human capacity, performance or comfort due to (work) activity

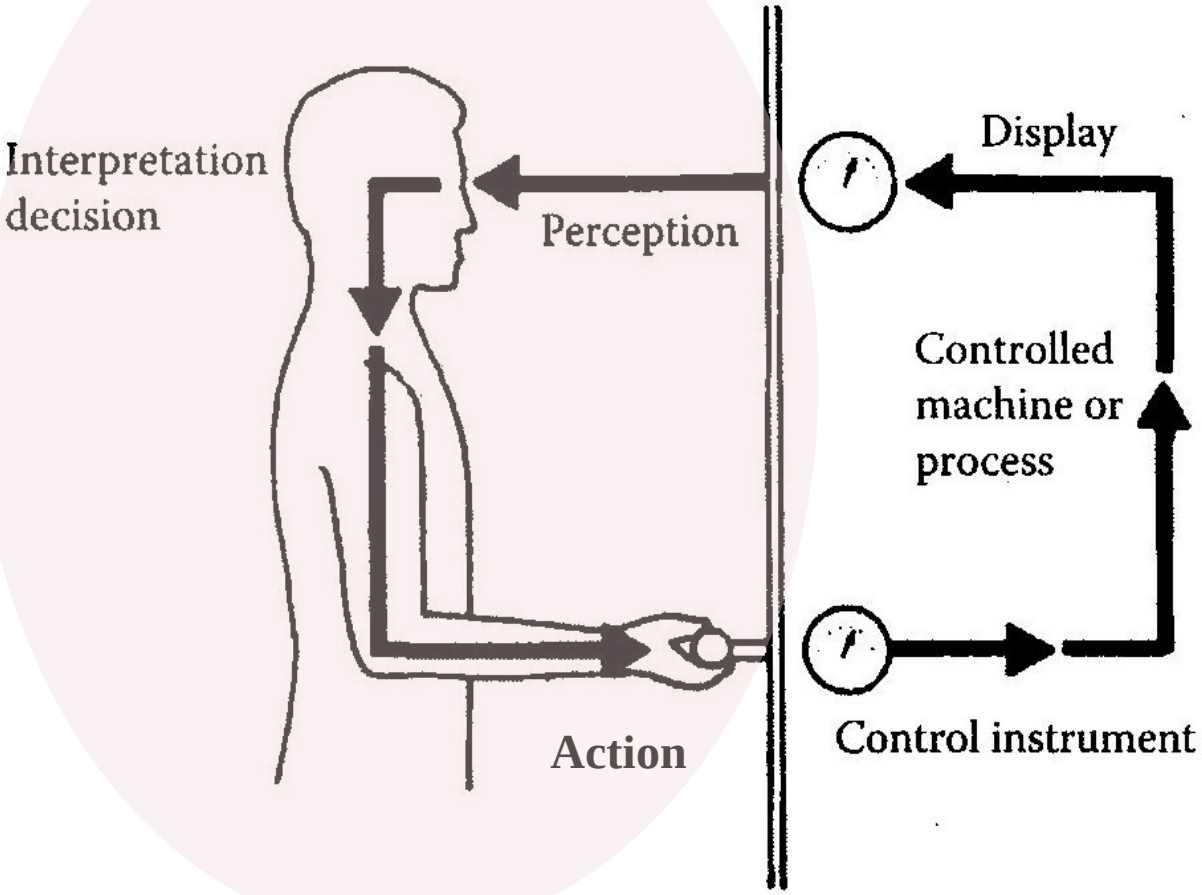
Definition?

Fatigue…

- a syndrome of physical and psychological effects…
- arising from a wide variety of causes and risk factors…
- resulting in:
  - impaired physical / mental performance (short-term)
  - increased risk of chronic physical conditions (long-term)

Carter and Muller

Some Effects of Fatigue



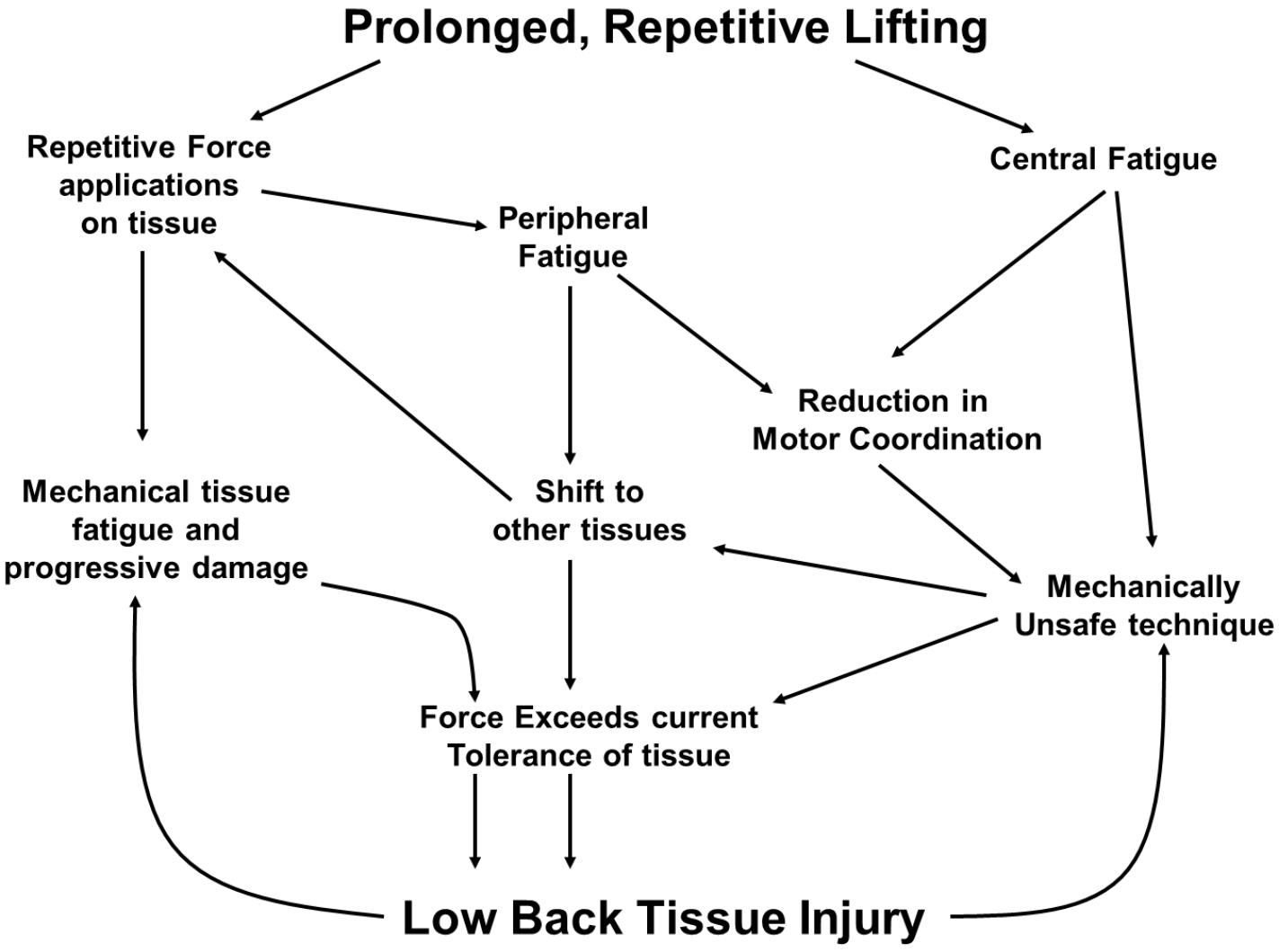
http://www.mercurious.com/wordpress/wp-content/uploads/2007/07/fig31_sketchpad.jpg

Fig 20.20 Text Page 383

Some Effects of Fatigue?

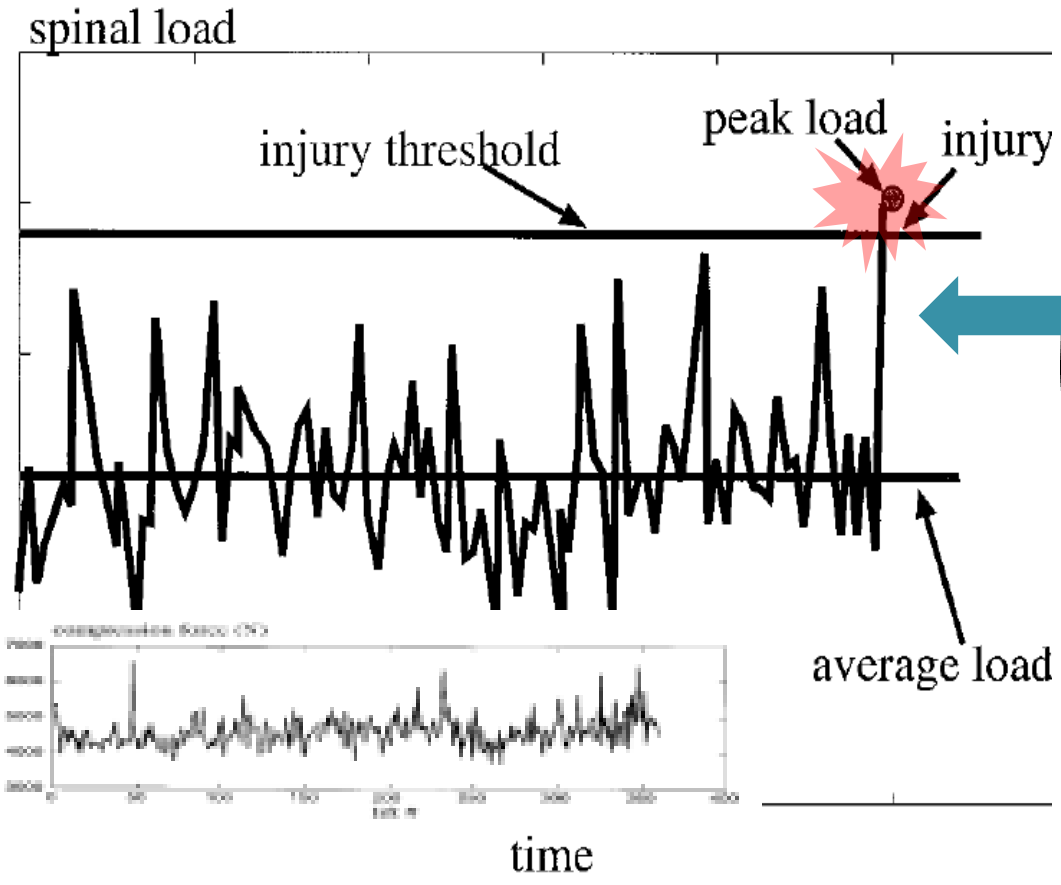
1. Effects on musculoskeletal disorders (MSD)?
2. Effects on comfort and wellbeing?
3. Effects on performance?
4. Effects on safety?
5. Effects on quality deficits?

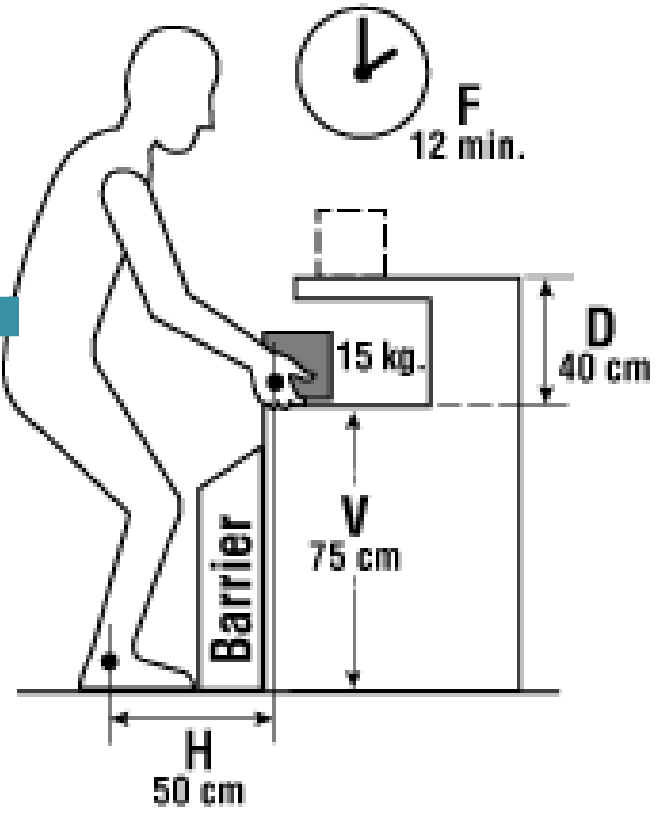
Effects on Musculoskeletal Disorders?



Potvin

Effects on Musculoskeletal Disorders?





Van Dieën 2001

Effects on Musculoskeletal Disorders?

During low level contractions, the same small number of muscle fibres are always active and may only turn off completely and rest infrequently…*Cinderella fibres*

The muscle as a whole is not fatigued but these few fibres are.

Could fatigue cause MSDs??

Demanding work

Fatigue

?

High load on the body

Musculoskeletal Disorders

Effects on Comfort +Wellbeing?

Swedish Occupational Fatigue Inventory (SOFI)

	Not at all						To a very high degree
	0	1	2	3	4	5	6
Lack of energy							
Worn out							
Spent							
Drained							
Overworked							
Physical exertion							
Palpitations							
Sweaty							
Out of breath							
Breathing heavily							
Physical discomfort							
Tense muscles							
Numbness							
Stiff joint							
Aching							
Lack of motivation							
Lack of concern							
Passive							
Indifferent							
Uninterested							
Sleepiness							
Falling asleep							
Drowsy							
Yawning							
Sleepy							

Effects on Performance?

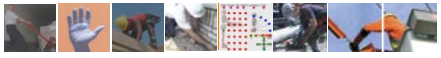
Impaired:

1. **Strength**
2. **Dexterity/ fine motor skills**
3. **Position sense**
4. **Balance**

Effects on safety?

1. **Balance and slips: delayed response to slips,**
2. **Effect on balance control**

Panjarit et al 2008 Effects of lower extremity muscle fatigue on the outcomes of slip induced falls



Effects on errors?

Surgical Incidents, by contributing factor

Systems factors	26	86%
Inexperience/lack of competence	75	53%
Communication breakdown	62	43%
Excessive workload/ inadequate staffing	30	22%
Lack of supervision	29	21%
Fatigue	21	16%
Interruptions/distractions	21	16%
Technology/equipment failure	22	15%
Administrative complexity/ bureaucracy	9	6%
Inappropriate protocol	2	1%
Ergonomics (lighting, space, etc.)	2	1%
Cognitive factors	126	86%
Error in judgment	92	63%
Failure of vigilance	72	49%
Failure of memory	5	3%

*

Gawande, Analysis of errors reported by surgeons at three teaching hospitals 2003

Effects on quality deficits?

In automotive assembly: Can product solutions related to poor ergonomics be identified:

a) in the quality assurance systems?
b) in the manufacturing engineering process?
c) in the assembly process?

- To what degree is there a correlation between poor assembly ergonomics and quality problems?

Falck Örtengren, Högberg . The influence of assembly ergonomics on product quality and productivity in car manufacturing – a cost-benefit approach
,

Effects on quality deficits?

Ergonomics load (risk) level	No. of assemblies	% share	Increased risk factor for quality errors compared to low load level
High (red)	19 / 18	43% / 56%	3.4 / 5.2
Medium (yellow)	17 / 16	44% / 33%	3.5 / 3.1
		87% / 89%	6.9 / 8.3 times
Low (green)	19 / 18	13% / 11%	
Total:	55 / 52	100% / 100%	

Falck Örtengren, Högberg . The influence of assembly ergonomics on product quality and productivity in car manufacturing – a cost-benefit approach
,

Five ideas to take away

1. Fatigue: A process leading to the impairment of human capacity, performance or comfort due to (work) activity
2. Fatigue affects many systems in the body
3. Fatigue likely increases MSD and safety risks
4. Fatigue likely reduces quality, productivity and increases errors
5. Approaches to reduce fatigue at work (and thus its ill-effects) are available… to be described during the day

Centre of Research Expertise for the Prevention of Musculoskeletal Disorders (CRE-MSD) presents

REDUCING FATIGUE AND PREVENTING MSDs IN THE WORKPLACE

9:00am | The Importance of Neuro-muscular Fatigue at Work

Speaker: Richard Wells, University of Waterloo

9:30am | Designing Jobs in Manufacturing: Rest Allowances

Speakers: : Linda Rose, KTH Royal Institute of Technology, Sweden and Patrick Neumann, Ryerson University

10:30am | Preventing Fatigue During Repetitive Tasks: Predicting Maximal Acceptable Loads Using Fatigue Curves

Speaker: Jim Potvin, McMaster University

11:15am | Fatigue During Prolonged Sitting and Standing

Speaker: Jack Callaghan, University of Waterloo

12:45pm | Relationships Between Physical and Mental Fatigue and Task Performance

Speaker: Ranjana Mehta, Michigan Technological University, USA

1:30pm | Healthy Office Work: Rest Breaks and Movement

Speaker: Michelle Robertson, Liberty Mutual, USA

2:30pm | Panel Discussion with Audience Questions