



The utility of strength measurement in the prevention of musculoskeletal injury

Michael McDonald



- Industry is doing a great deal to manage the issue of “fitness for duty”:

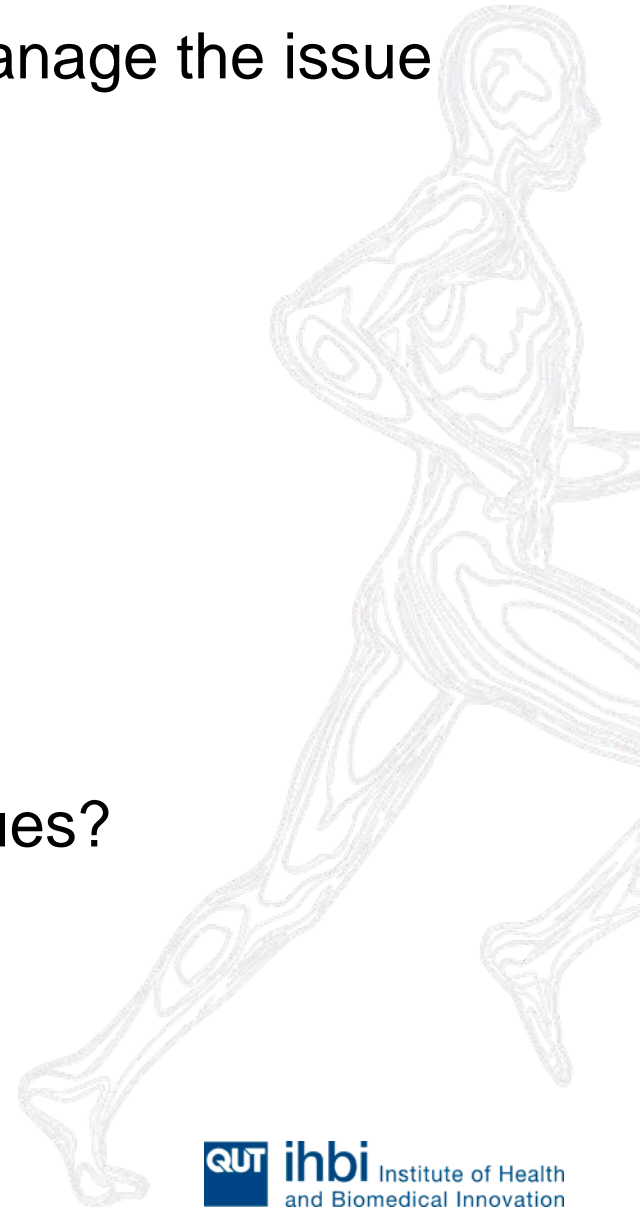
- drug and alcohol usage

- stress management

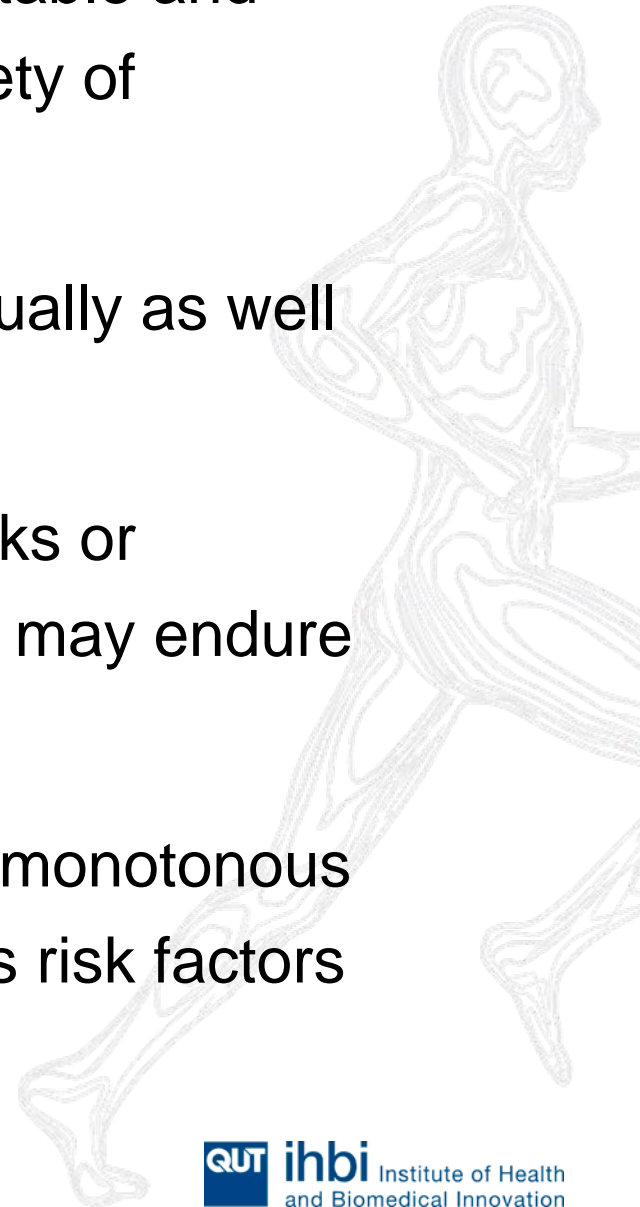
- shift work related issues

but,

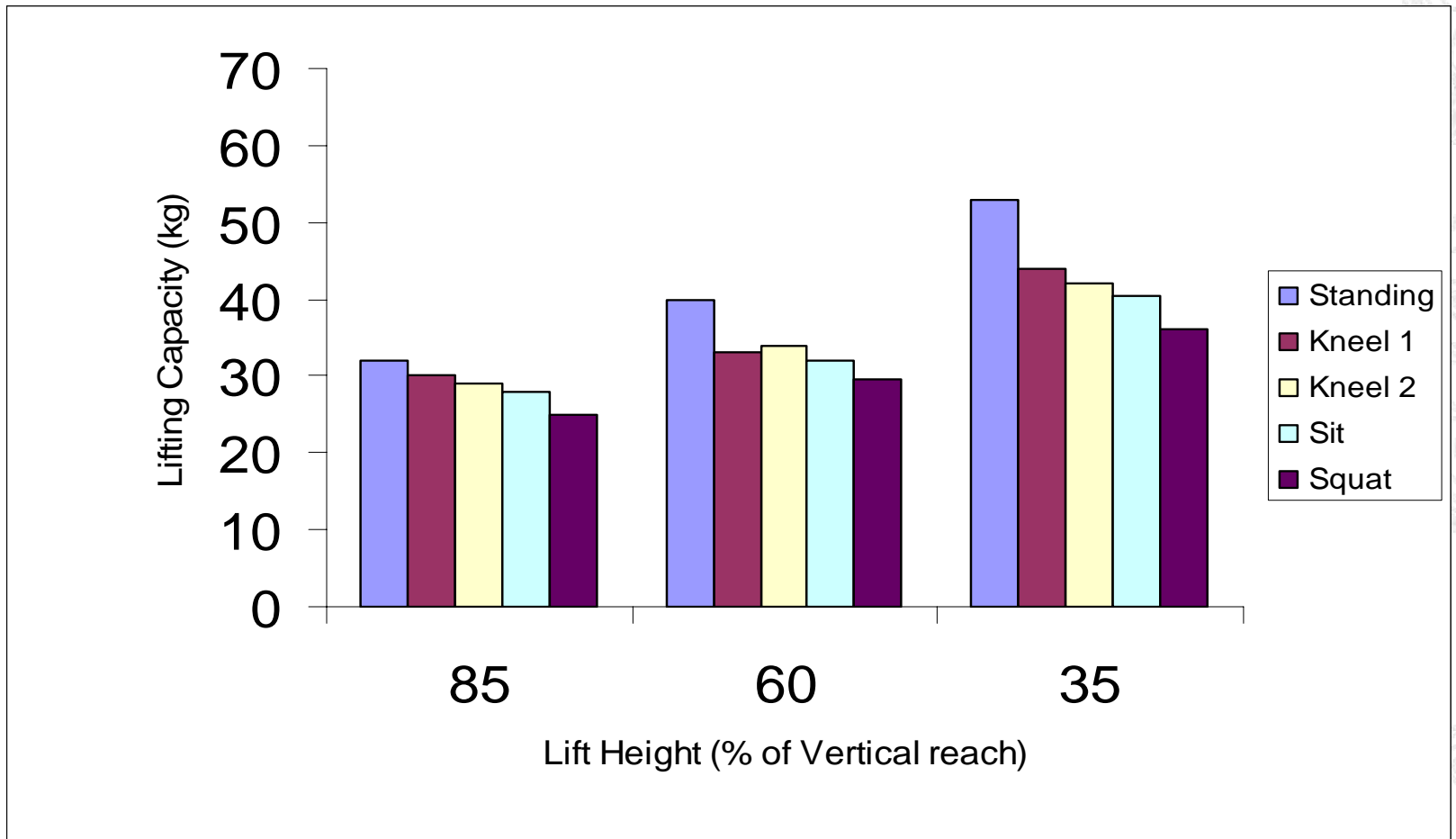
- musculoskeletal related issues?



- The human body is remarkably adaptable and capable of performance in a wide variety of environments and circumstances.
- Though, the body cannot perform equally as well under all conditions.
- In fact, when faced with awkward tasks or demands, the musculoskeletal system may endure substantial performance limitations.
- Heavy lifting, awkward postures and monotonous and repetitive work tasks are known as risk factors for MSI (Bernard, 1997; Kuornka & Forcier, 1995)



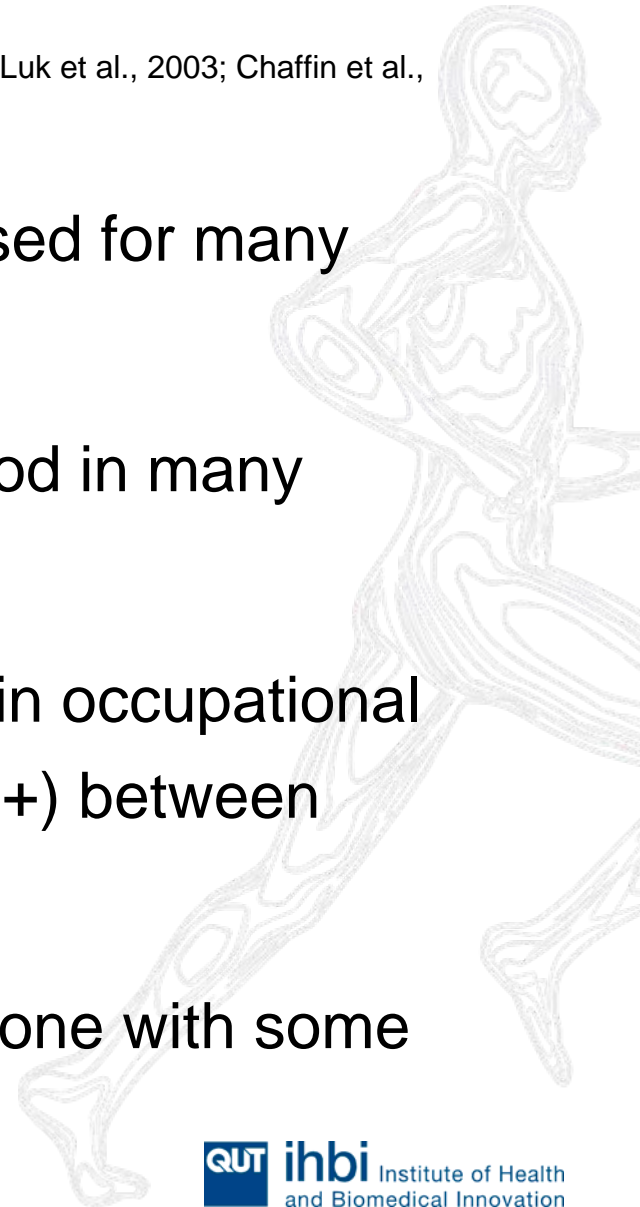
Acceptable loads for single lifts in several postures (Gibbons, 1989)



- The use of muscle strength tests is not only of great interest, but has a number of benefits for all workers.
- The importance of individual strength capacity for the occurrence of work related musculoskeletal injury remains controversial (Essendrop, et al. 2001; Dahlberg, et al. 2004).
- Despite this controversy, strength measures together with measures of endurance and range of motion are still essential measures used in the evaluation of work demands and workers' physical capacities.

Isometric vs. Isokinetic strength tests (Luk et al., 2003; Chaffin et al., 1991; Stephens et al., 2006)

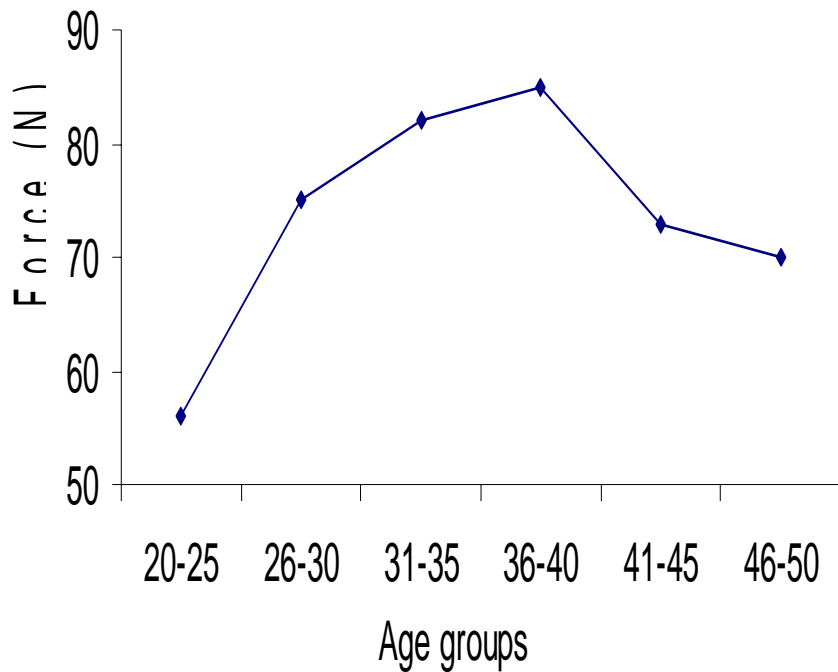
- Isokinetic strength tests have been used for many years
- Isometric remains the preferred method in many workplace studies.
- Isometric tests are simple to perform in occupational settings, & high correlation ($ICC = 0.80+$) between isometric and isokinetic.
- Interpretation of values needs to be done with some caution.



Comparison between Isometric and Isokinetic forces generated at low, waist and shoulder assessment levels (Lu, et al. 2003)

| | Isometric | Isokinetic | T-value |
|----------|---------------------|-------------------|---------|
| Low | 99.84 \pm 50.64* | 55.65 \pm 27.52 | 7.395 |
| Waist | 67.17 \pm 24.93* | 43.48 \pm 17.04 | 7.565 |
| Shoulder | 105.76 \pm 42.95* | 42.22 \pm 15.80 | 13.392 |

- Data similar to a number of other studies (Kamon et al 1992 & Mital et al. 1986)
- Body posture has an influence upon the magnitudes obtained.
- Inertial properties of the two testing systems & velocity of the movement.

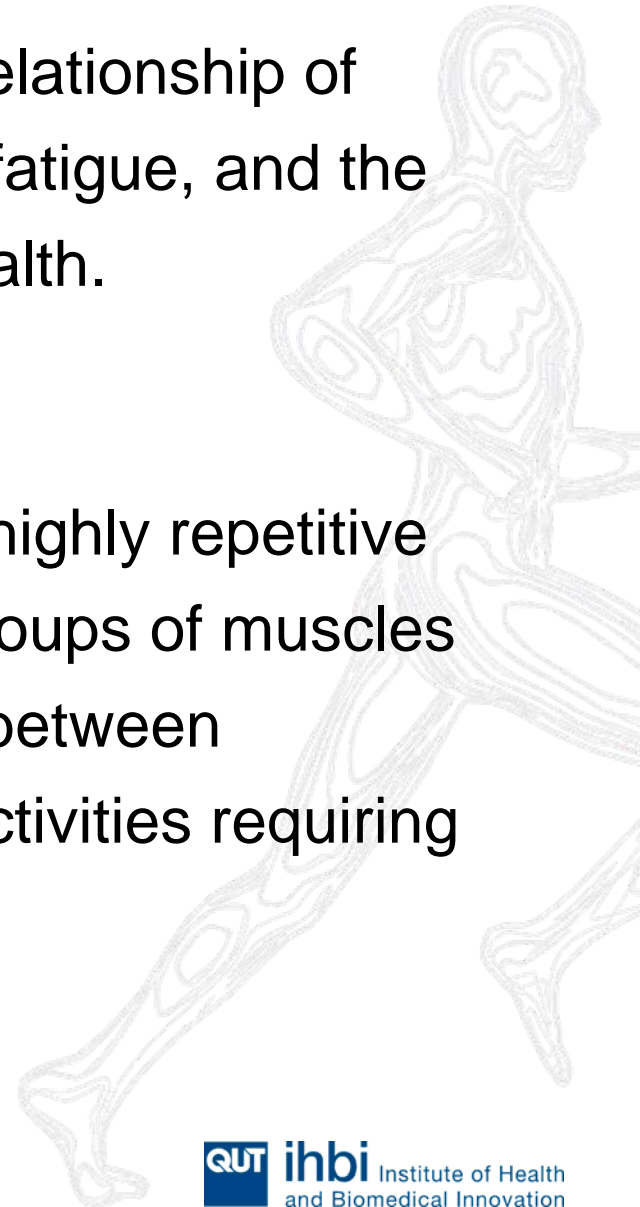


(Luk, et, al. 2003)

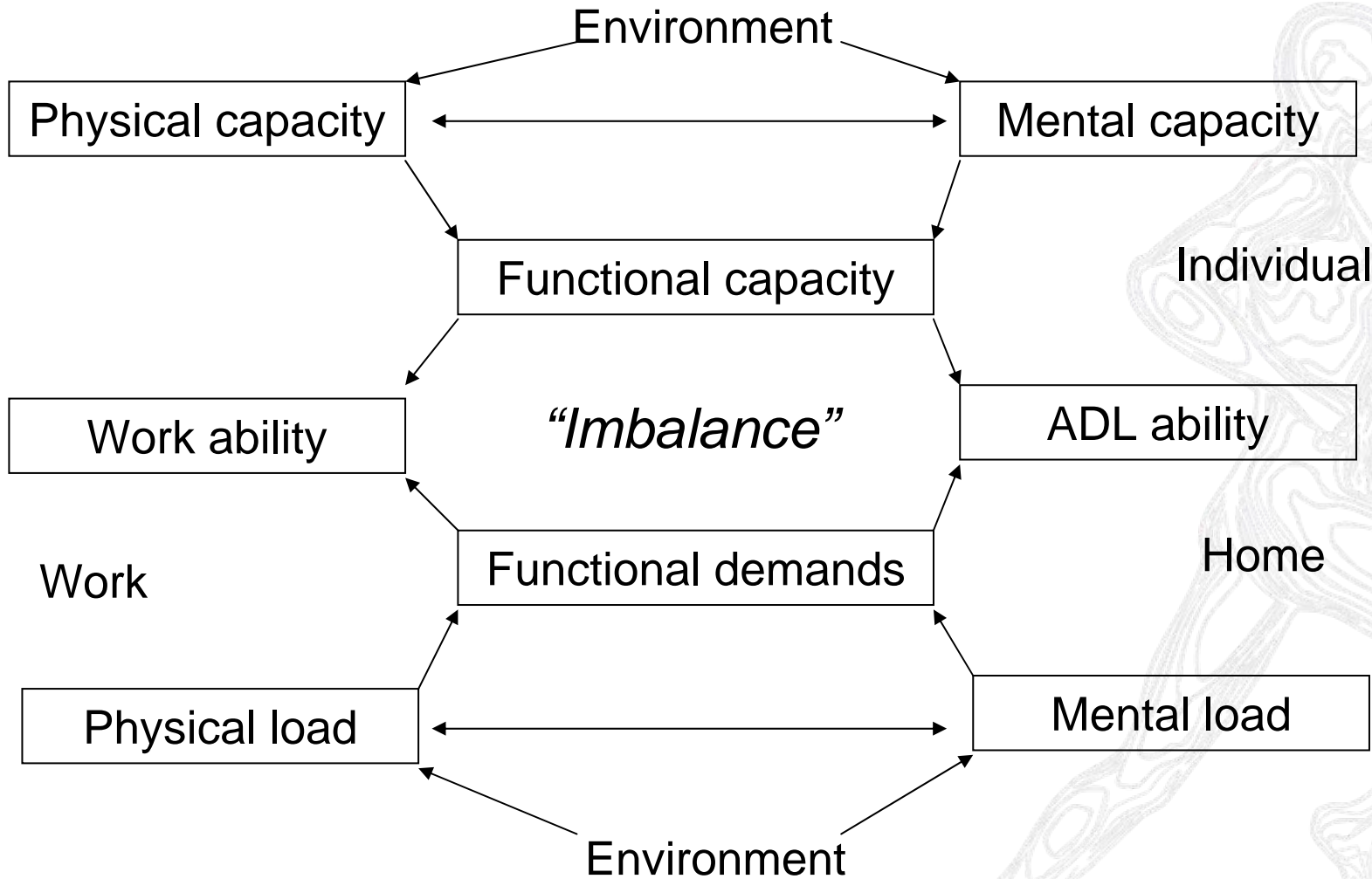
- Strength capacity declines with age, but at somewhat different rates for different occupational groups as well as for different muscle groups.
- While strength within the upper extremities remains relatively unchanged to approx 50yrs, a decline in leg muscle strength is observed.

(Dahlberg et al.,2004)

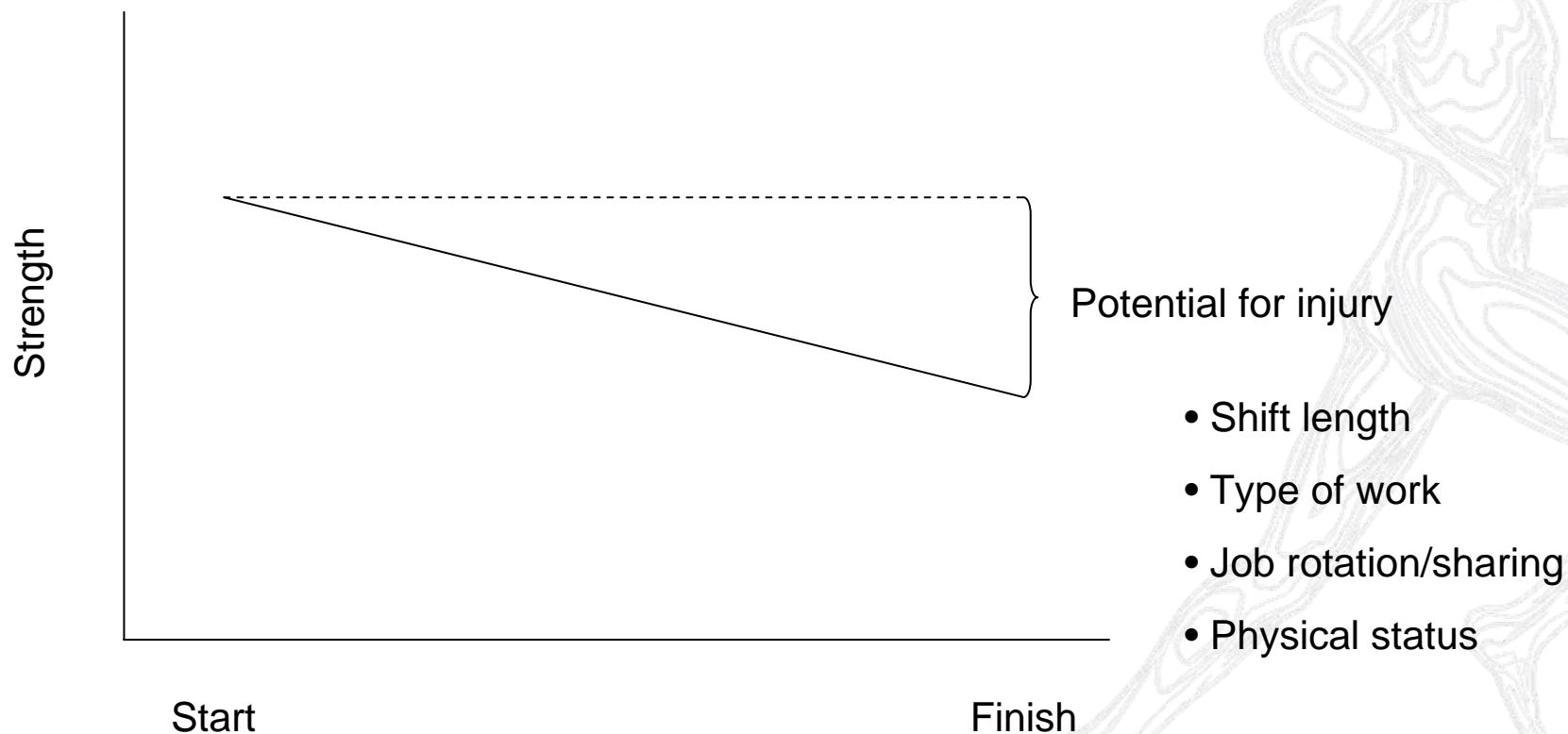
- The principal area of concern is the relationship of musculoskeletal injuries generated by fatigue, and the effects upon the workers' long term health.
- Local muscle fatigue can result from highly repetitive activity, where individual muscles or groups of muscles do not have an opportunity to recover between contractions, or from static muscular activities requiring heavy workloads.



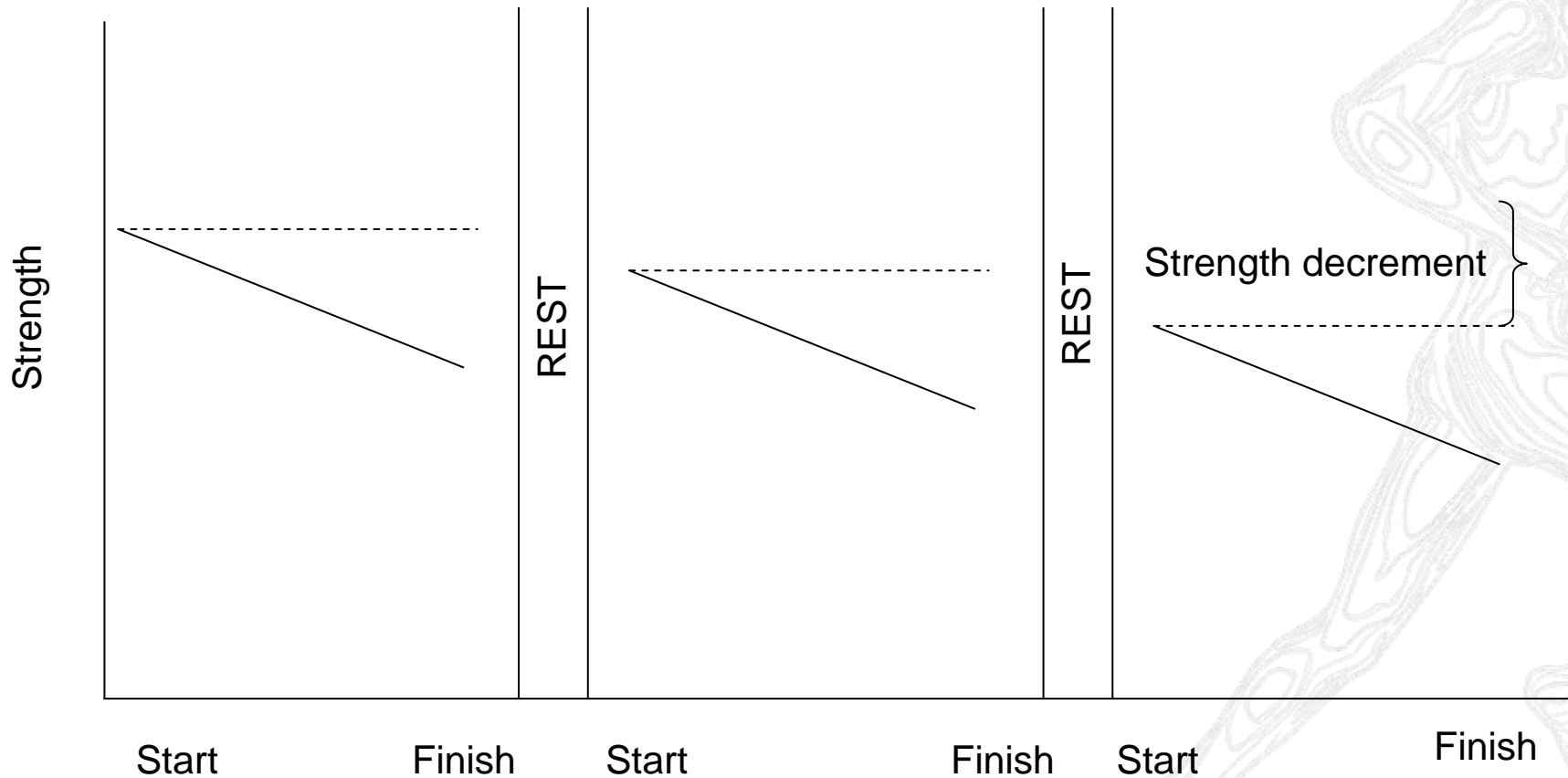
Load-Capacity model



Shift length and number of cumulative workdays should be designed to allow the worker to recover for the next work shift/roster

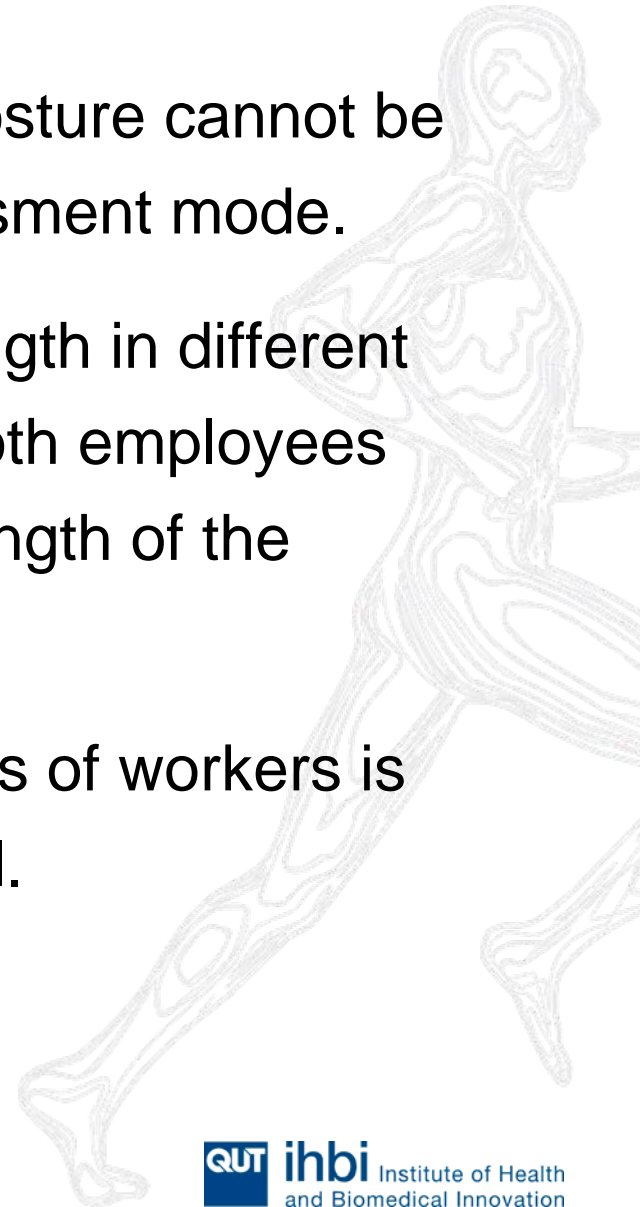


What is the accumulative effect upon the musculoskeletal system and the potential for injury?



Summary

- Strength measures from one position/posture cannot be predicted for different positions or assessment mode.
- A specific set of normative data on strength in different modes and levels is important to guide both employees and employers as to the actual lifting strength of the individual.
- Data on the physical strength capabilities of workers is fundamental to the safety of the individual.



Acknowledgements

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THANK YOU

