



University of  
**Strathclyde**  
Science

# Temperature and velocity interactions in neuromuscular function during locomotion in older people

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# Introduction

Locomotion and functional ability are important for quality of life

Power and efficiency are important determinants of locomotion

‘Explosive’ power is well investigated

Little is known about ‘sustained’ power i.e. mechanical efficiency



# Physiological background

Mechanical efficiency = power output / energy expenditure

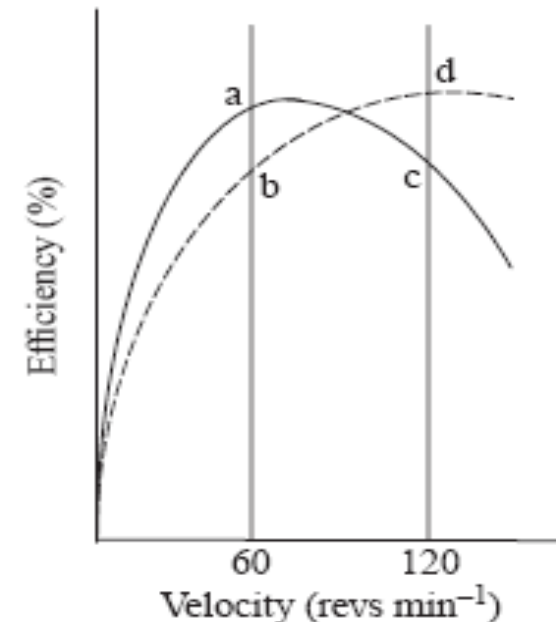
Influenced by speed of contraction and temperature

Speed of contraction:

slower muscle contractile properties  
structural and functional factors

Muscle temperature:

lower muscle temperature  
physiological and social factors



# Objectives

To investigate how contraction speed and muscle temperature influences the efficiency of locomotion in the older population

To investigate the neuromuscular mechanisms that underpin the efficiency of locomotion in the older population

- muscle fibre composition
- muscle recruitment patterns

# Methods

## Participants

Young: females between 18 and 35 years (n=14)

Older: females between 75 and 85 years (n=14)

## Protocol

Cycling exercise at 4 contraction frequencies (30, 45, 60 and 90 rpm) and 3 muscle temperatures ( $\sim 32^{\circ}\text{C}$ ,  $\sim 35^{\circ}\text{C}$  and  $\sim 38^{\circ}\text{C}$ )

## Measurements

Mechanical efficiency (pulmonary gas exchange)

Neuromuscular activity (surface electromyography)

Muscle fibre composition (needle biopsy of vastus lateralis)

# Future Work

Functional –

BWU experiments: faster walking speed for same energy cost  
(training studies)

medical devices: maintaining optimal muscle temperature

Mechanistic –

cellular muscle function –  $\text{Ca}^{2+}$ ,  $\text{Na}^+$ - $\text{K}^+$  handling

muscle-vascular interface

(utilise the human muscle sampling procedure)