

# **Physiology Changes at different stepping rates**

By

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# **Introduction- Aim**

To find out the changes in physiological activity in the body of someone performing 3 increasingly difficult stepping exercises

# Participant(s)

1

Male

18

Trained athlete

62.1kg

2 (Data unusable)

Male

20

Average training level

73kg

# Apparatus

- Heart Rate monitor and strap
- Blood pressure monitor
- Borg scale
- Douglas bag
- Air tubes
- Oxygen face mask
- Stopwatch
- Stepping board
- Metronome
- Computer for results
- Oxygen and co2 analyser machine + L  
of air calculator
- Weighing scales
- Barometer
- Thermometer

# Pictures



# Conditions

**1**

0 steps/min

15cm Box

**2**

80 steps/min

15cm Box

**3**

160 steps/min

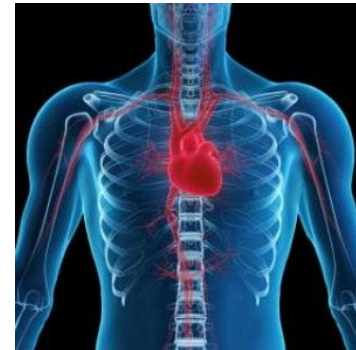
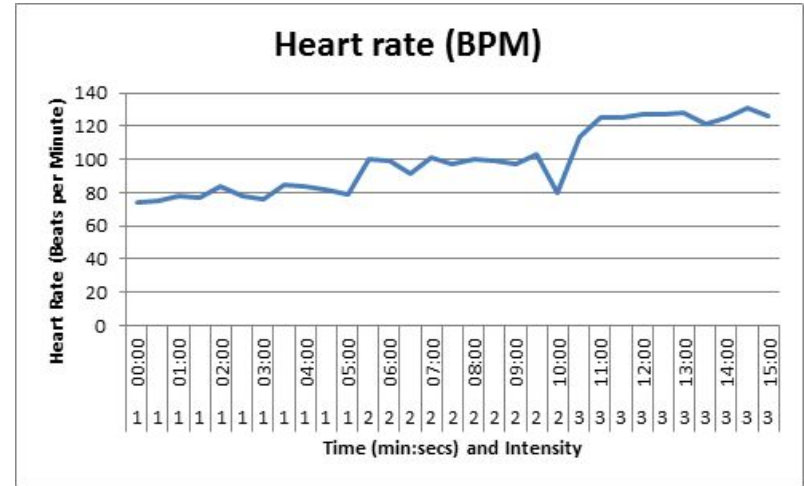
15cm Box

# Method

- Measure HR every 30s
- Borg scale every 60s
- Respiration rate for 30s
- Blood pressure in the last 30s of each exercise
- Used a douglas bag to collect amount of air for 180s Intensity 1, 120s Intensity 2, 90s Intensity 3
- Used a gas analyser to collect the volume, O<sub>2</sub> and CO<sub>2</sub> from expired air in the douglas bag

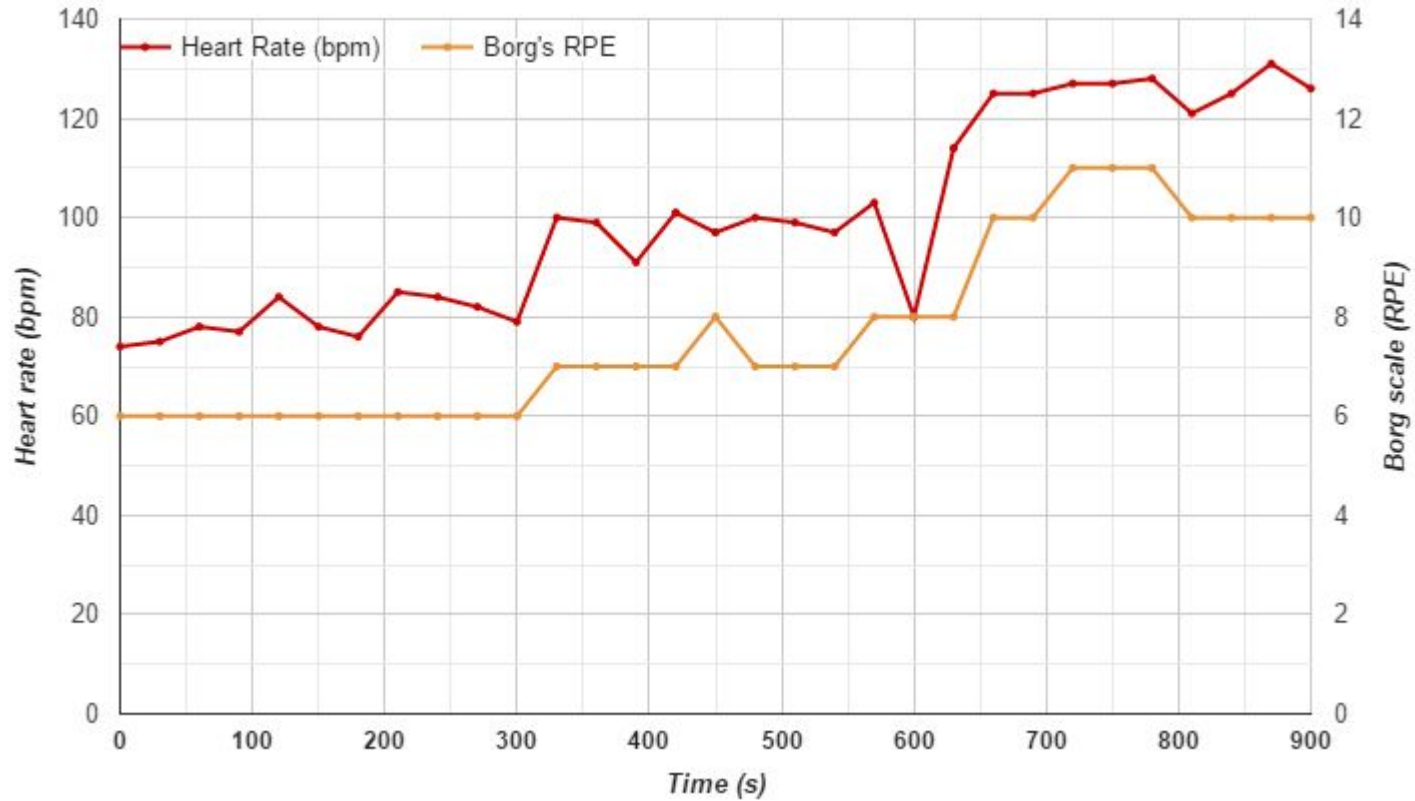
# Results-Heart Rate

- Results revealed a steady climb over the 3 intensities
- Maximal HR during exercise, only 128, still quite low
- Show expected trend between increased need and consumption for oxygen to fuel working muscles and increase in HR
- Cardiac output increased due to higher HR and stroke vol...
- ...because the sympathetic nerves stimulate the heart to beat at a higher rate

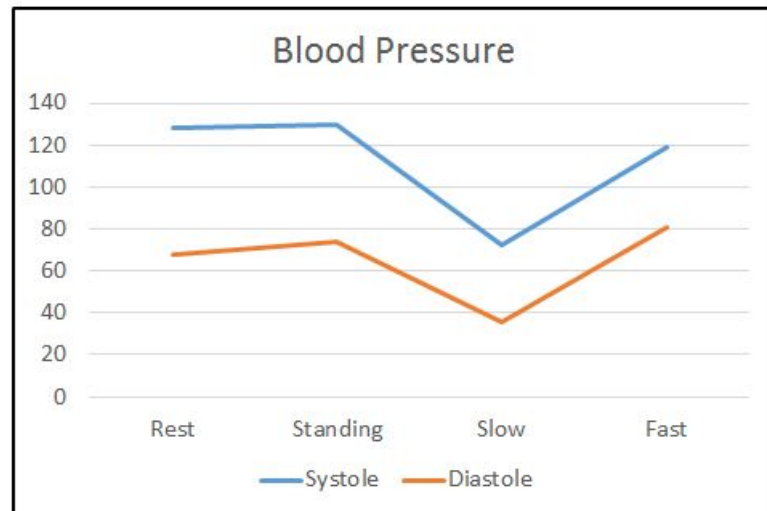




# Results-Borg scale

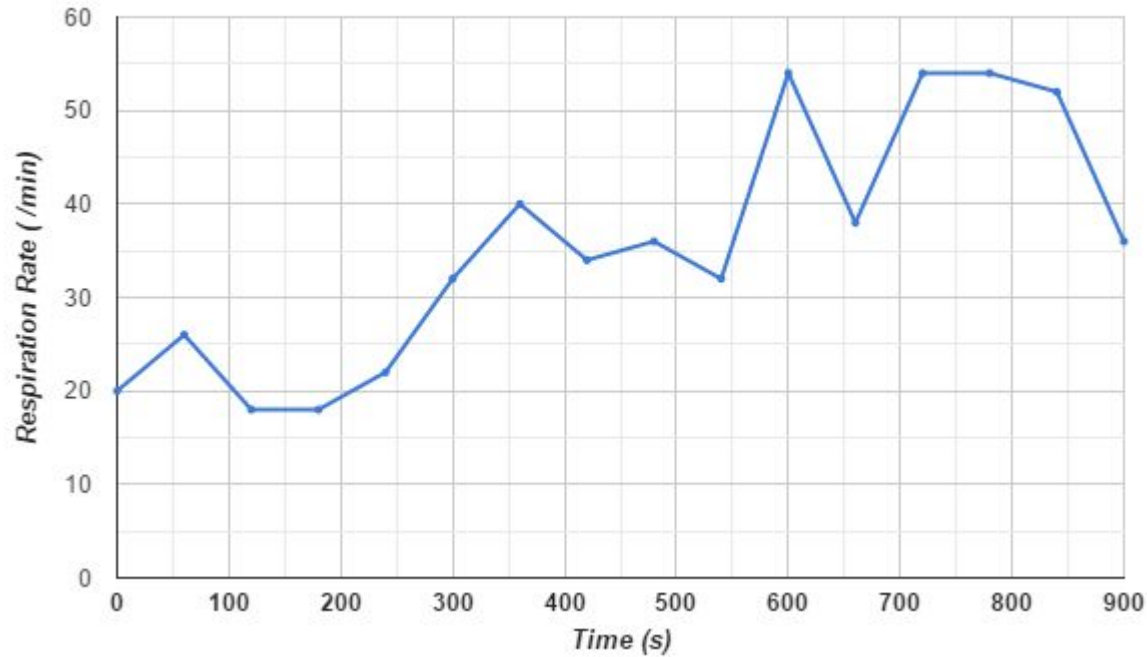


# Blood Pressure



Motion	Systole	Diastole
Rest	128	68
Standing	130	74
Stepping (slow)	72	36
Stepping (fast)	119	81

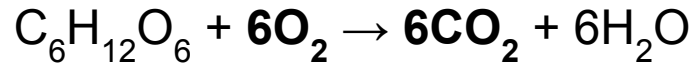
# Results-Respiratory Rate



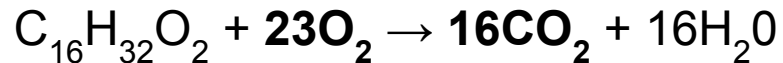
# Results - RER

Condition	RER
Standing (0bpm)	0.67
Slow (80bpm)	0.86
Fast (160bpm)	0.82

## Glucose:



## Palmitic acid:



RER	FAT%	CARB%
1.00	0	100
.98	6	94
.96	12	88
.94	19	81
.92	26	74
.90	32	68
.88	38	62
.86	47	53
.84	53	47
.82	62	38
.80	68	32
.78	74	26
.76	81	19
.74	88	12
.72	94	6
.70	100	0

# Metabolic rate

Worked out metabolic rate from using weir's formula. Taking the barometric pressure and room temp working out the conversion factor by drawing a line from nomogram.

# Results-Metabolic Rate and RQ

Intensity 1 - 0.12 Kcal/min

Intensity 2 - 6.1Kcal/min

Intensity 3 - 9.1Kcal/min

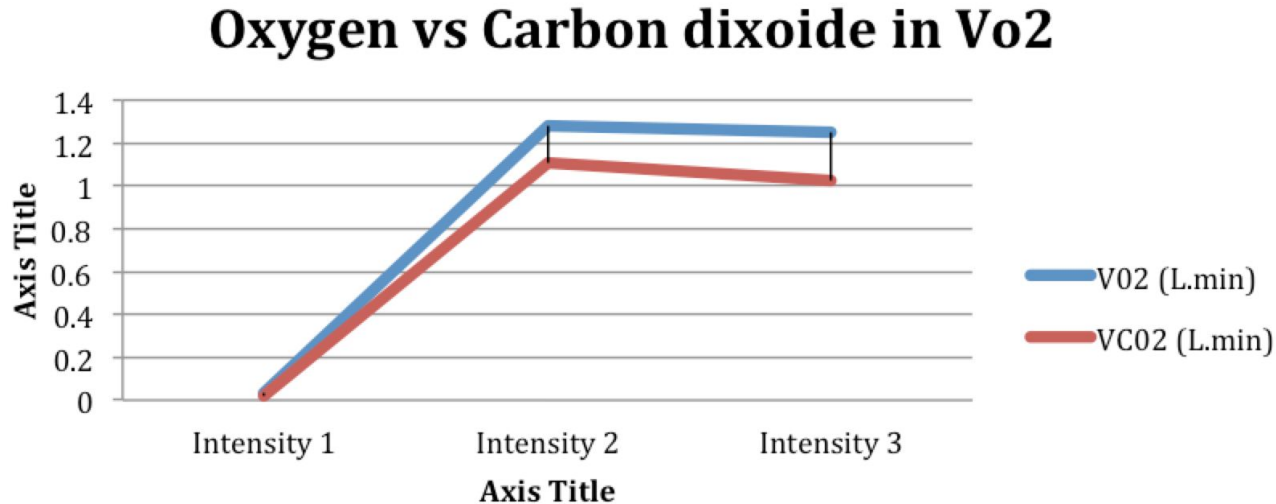
Intensity 1 - 0.67 (Fats)

Intensity 2 - 0.86 (Proteins)

Intensity 3 - 0.82 (Proteins)

# VO2 and VCO2

The intensity from 2 to 3 the VO2 decreased by 0.5ml this could be due to the participant being an endurance athlete get into a comfortable stage, and relax due to them training regularly at around 130 HR



# Predicted VO<sub>2</sub>

Taking the Heart rate and VO<sub>2</sub> and plotting on a graph, drawing line of best fit can predict the vo<sub>2</sub> max. That was 63 ml.kg.min

- Intensity 1 - 0.8% of predicted VO<sub>2</sub> max
- Intensity 2 - 33% of predicted VO<sub>2</sub> max
- Intensity 3 - 32% of predicted VO<sub>2</sub> max



# Evaluation

## Issues

- Participant knew they were being tested
- Hard to keep up with the metronome
- External influences (laughing and distractions)
- Blood pressure cuff worked intermittently

# Evaluation-2nd subject

- Inappropriate clothing- had to put blood pressure cuff over shirt so did not work
- Not enough people to take measurements
- Douglas bags opened before measurements taken
- Pace too fast
- Heart rate monitor was malfunctioning non-obviously

# Further Improvements

- Higher step to increase intensity over the increase of pace
- No prior warning of pace change
- No warning when measurements are taken-headphones with metronome facing away from unwanted visual stimuli