

Exercise as a Rehabilitation Tool for patients with Neurological Disorders



Rotem Soll (MscPT)



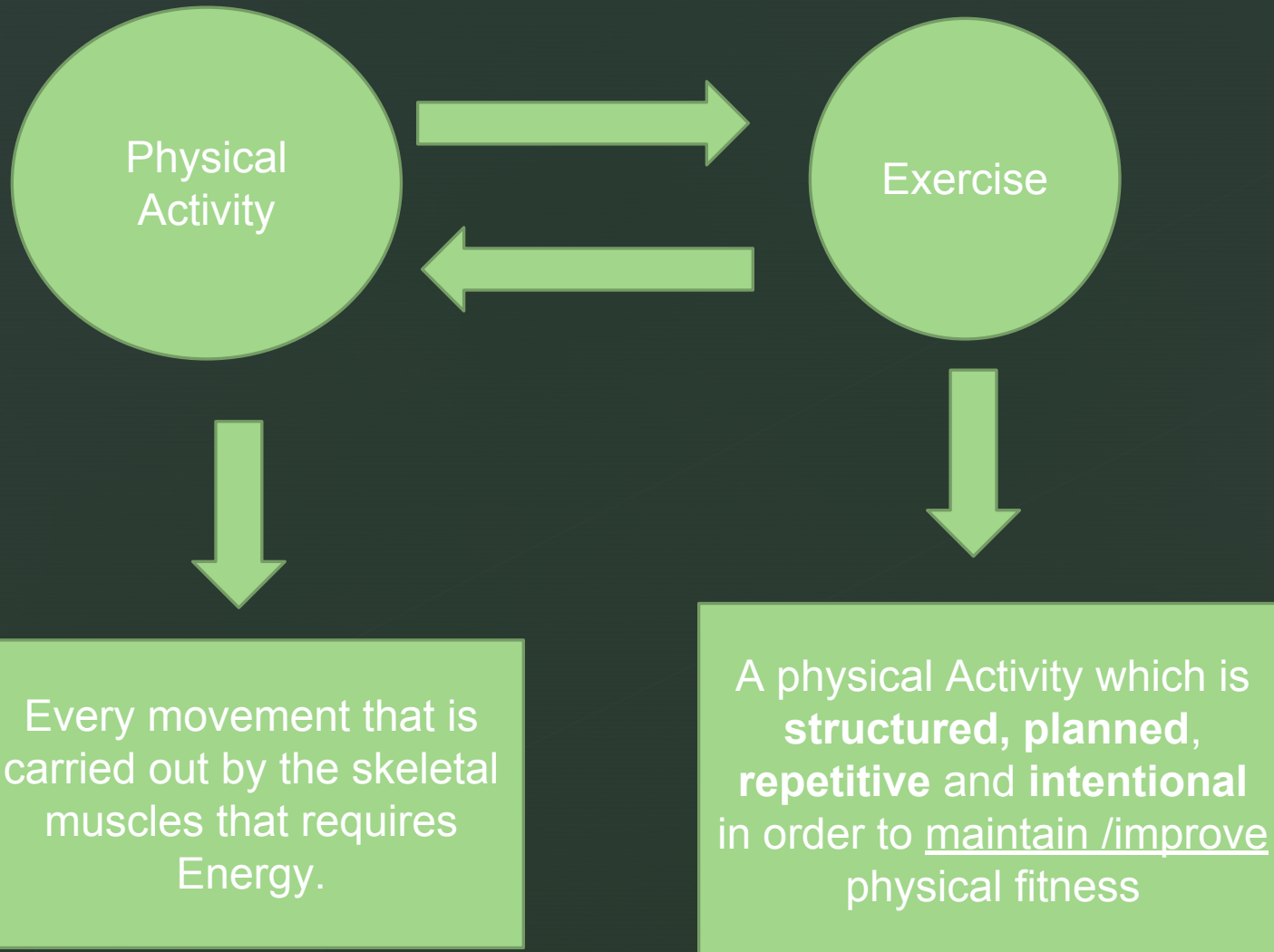
פיזיותרפיה - פילאטוס שיקומי - איכון גופני

Aim of the Course



- To identify the challenges of adjusting exercise for individuals with neurological disorders
- To understand the Neurophysiological Effect of exercise on Neurological impairment
- Understand the effect of exercise on fatigue , cognition and spasticity in Neurological Disorders
- Build exercise programs for individuals with Neurological Disorders

...Just a reminder



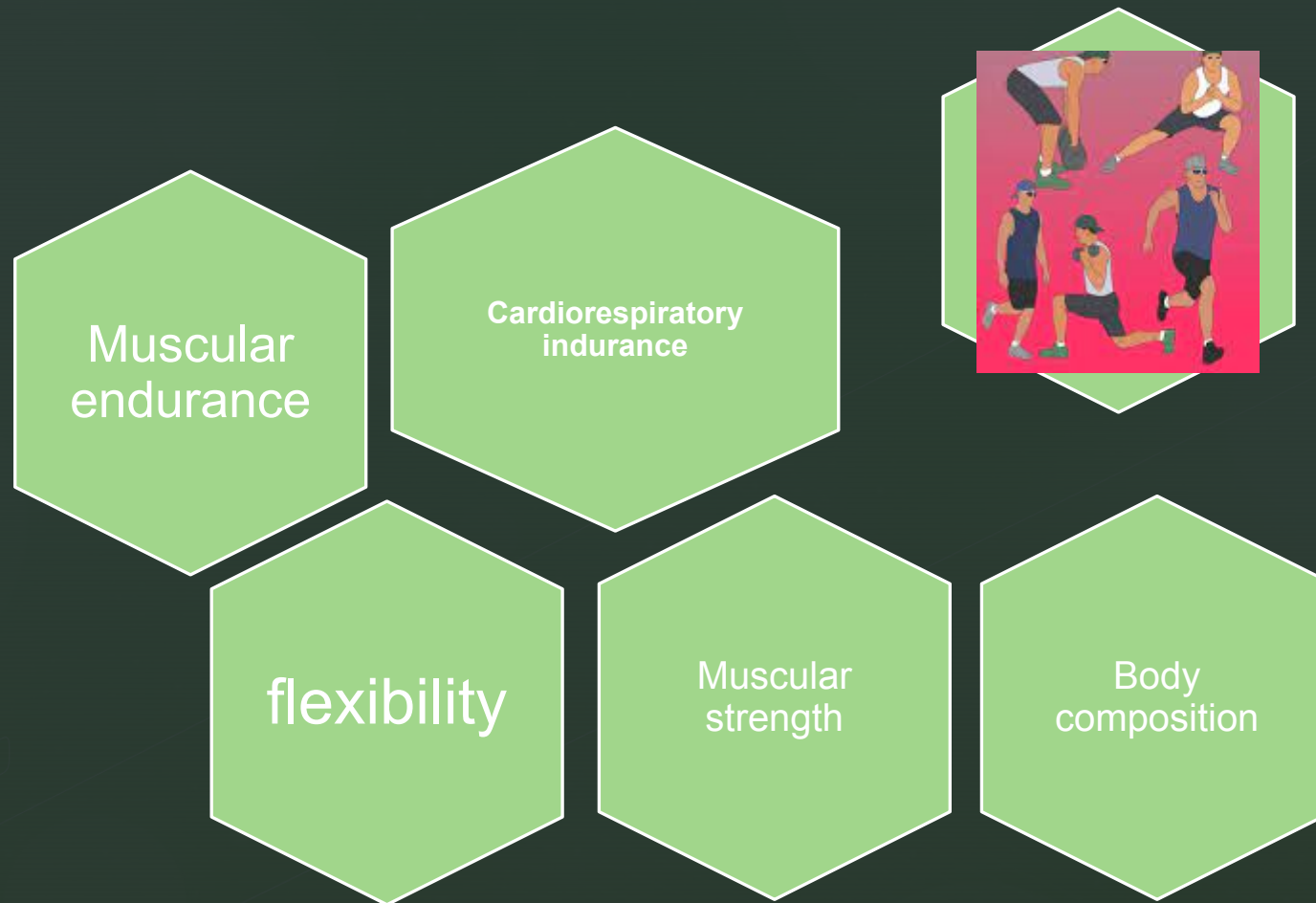
RPE Chart

Rate of Perceived Exertion

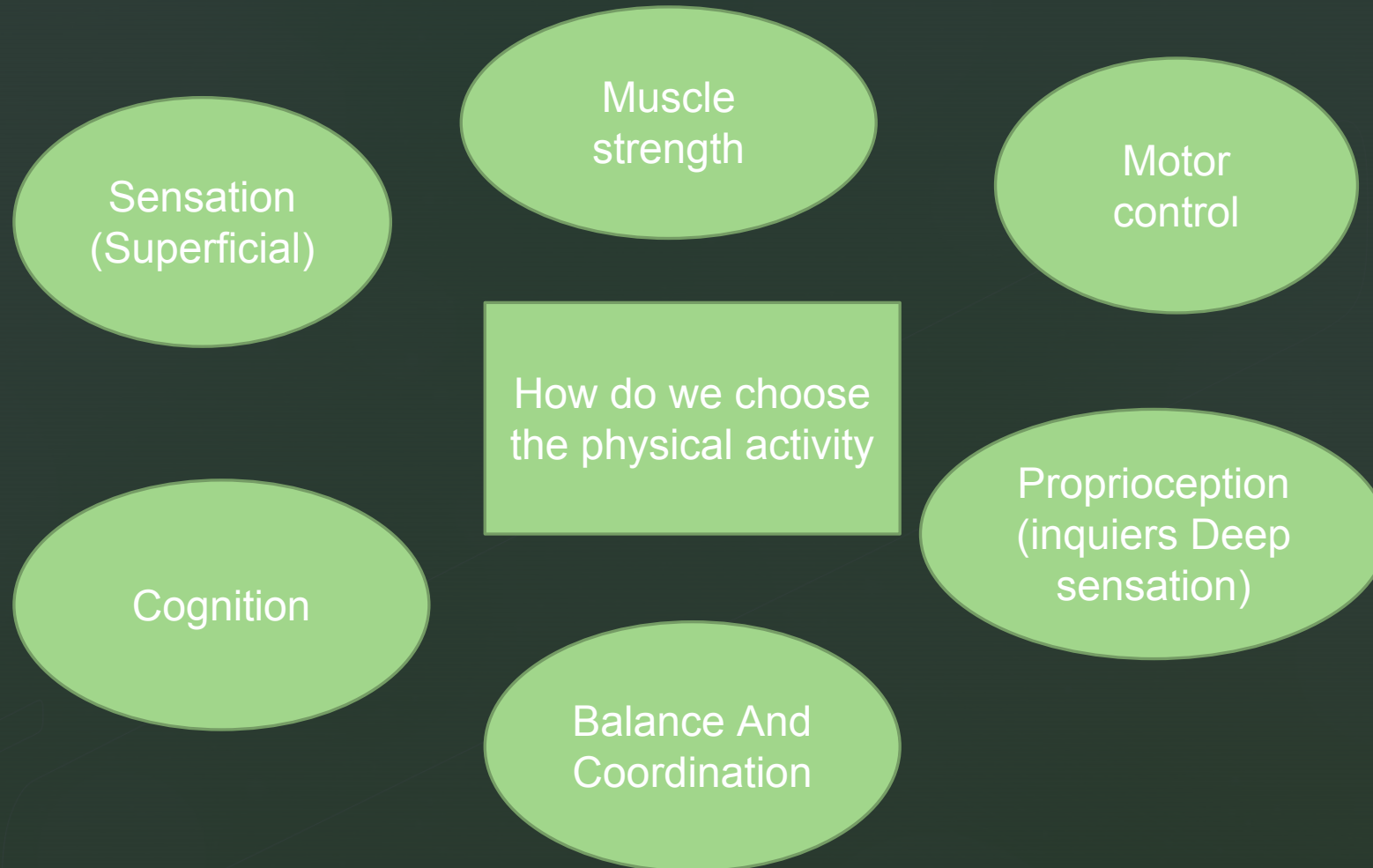
10	Max Effort Activity Feels almost impossible to keep going. Completely out of breathe, unable to talk.
9	Very Hard Activity Very difficult to maintain exercise intensity. Can barely breath and speak a single word.
7-8	Vigorous Activity On the verge of becoming uncomfortable. Short of breath, can speak a sentence.
4-6	Moderate Activity Feels like you can exercise for hours. Breathing heavily, can hold short conversation.
2-3	Light Activity Feels like you can maintain for hours. Easy to breathe and carry a conversation.
1	Very Light Activity Anything other than sleeping, watching TV, riding in a car, etc.



The Components of physical fitness



Challenges of exercise with a Neurological Disorder



Parameters and Evaluation of exercise

- Intensity
- Duration
- Frequency
- Internal/External Representation AND focus (Ques)
- Inner /outer Motivation

Physical Frailty
(Marzetti,2017)

Sarcopenia
(Marzetti, 2017)

Aims of exercise with a Neurological Disorder

- Prevention
- Prevention of secondary complications due to sedentary lifestyle (e.g after stroke..)
- Improving quality of life with a chronic neurological illness

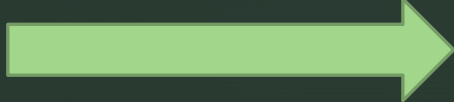
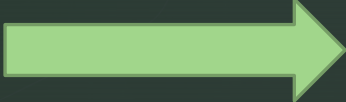
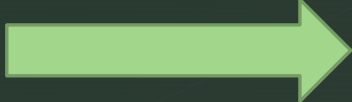
Cardiovascular
disease
(Kopunek,2007)

Diabetes
(Qureshi,2001)

Depression
(Kopunek,2007)

(Richardson,2018)

Neurophysiological effect of sedentary Lifestyle

- Lack of muscle activity 
- suppression of Skeletal muscle lipoprotein lipase (LPL) 
- Decreased Levels of HDL cholesterol 
- Increased Triglycerids, Insulin resistance and glucose Intolerance

Neuroplasticity of the Brain and exercise

- Treadmill exercise (High intensity Aerobic Exercise) created a Neuroplastic response in the motor cortex (Mellow,2020)
- Increase of Neurotrophins
- Improvement of synaptic function and structure
- Acceleration of neural function reorganization
- Facilitating a compensation beyond the inflected tissue

Benefits of exercise with a Neurological Disorder

- Gaining Aerobic capacity (Richardson , 2018)
- Gaining **task specific abilities** with functional exercise
- Improving Gait components: speed, stride length, balance, confidence
- Increase Overall Physical Activity Levels (minimizing sedentary behavior)
- Secondary prevention in acute neurological disorders
- Self efficacy (Bandura- an individual's perception of or confidence in his or own ability to complete a behavioral sequence to achieve a specific goal)

Self efficacy was the most common Reliable predictor of exercise Behavior

(Suskin , 2018)

- Beliefs about PA
- Feelings (“ IT is all my fault..”)
- Depression
- Fatigue
- What is self determination ?

Additional challenges in adapting to a Healthy lifestyle

- Persistency
- Motivation
- Lack of structured programs
- Adapting to new changes (Especially in chronic patients)
- Most of the programs are developed for research purpose – limited in time!
- Self-management or structured-group program

Aerobic or Resistance Training for Improving physical function in MS patient

(Laurits,2021)

- What exercise suits me the Best?
- Parameters needed to measure Improvement: Muscle strength, VO2MAX, 6MWT, Fatigue
- There was no difference between AT AND RT In all parameters
- Only some of the studies reported physical adaptations although the physical function has improved.

Cerebro Vascular Accident

- Stroke survivors sit for more than 10 hours a day (Kerr,2015)
- Sitting time is the highest During the first year after stroke (Paul, 2016)
- 50% of stroke survivors do not match their recommended step count (English , 2014)

Age	Steps Per Day: Minimum	Steps Per Day: Active	Steps Per Day: Highly Active
4-6 years old	6,000 steps	10,000 steps	14,500 steps
6-11 years old (female)	6,000 steps	11,000 steps	13,500 steps
6-11 years old (male)	6,000 steps	13,000 steps	15,500 steps
12-19 years old	6,000 steps	10,000 steps	12,500 steps
20-65 years old	3,000 steps	7,000 steps	11,500 steps
65+ years old	3,000 steps	7,000 steps	10,500 steps

Cerebro Vascular Accident

Modifying the risk factors for a second stroke

- **Blood pressure** (In rest and Exercise)
- Improvement in BP at submaximal load was reported but not in rest HR after Stroke (only in people with light to moderate Disability)
- **Dyslipidemia** (It was not improved due to exercise in people with Modified Disability)
- **Diabetes Mellitus** (Improvement in insulin sensitivity and glucose tolerance)

STUDY PROTOCOL

Open Access

FIT for FUNCTION: study protocol for a randomized controlled trial



Julie Richardson^{1*}, Ada Tang¹, Gordon Guyatt², Lehana Thabane^{2,3}, Feng Xie^{2,4}, Demetrios Sahlas^{5,6}, Robert Hart^{5,7}, Rebecca Fleck⁶, Genevieve Hladysh⁸ and Louise Macrae⁵

- 12 weeks
- Self management Education Program
- 60 minutes –twice a week
- Warm up, task-oriented strengthening and cardiovascular conditioning, Mobility and balance, cool down.



Exercise therapy for muscle and lower motor neuron diseases

AISHA MUNAWAR SHEIKH, JOHN VISSING

Copenhagen Neuromuscular Center, Department of Neurology, Rigshospitalet, University of Copenhagen, Denmark

- A notion being that contractions in the pathological muscle would damage and accelerate the disease process (tried in mice with duchenne)- Electrical stimulation and eccentric contraction)
- Higher chance to develop a metabolic syndrome due to restricted mobility among patients with LMN diseases
- Moderate intensity aerobic and strength exercise has many benefits for patients with LMN , no muscle damage nut it should be planned and well monitored.

JAMA Neurology | **Original Investigation**

Effects of Mindfulness Yoga vs Stretching and Resistance Training Exercises on Anxiety and Depression for People With Parkinson Disease A Randomized Clinical Trial

Jojo Y. Y. Kwok, PhD, MPH, BN, RN; Jackie C. Y. Kwan, MSocSc, PDMH, BSW, RSW; M. Auyeung, MBChB; Vincent C. T. Mok, MD, MBBS; Claire K. Y. Lau, MSc, BN, APN; K. C. Choi, BSc, PhD; Helen Y. L. Chan, PhD, BSN, RN

- Anxiety and Depressive Symptoms
- Severity of motor symptoms
- HRQOL(Health Related Quality Of Life)
- Referring the specific parameters, yoga and mindfulness were found to be as effective as SRTE for individuals with mild to moderate parkinson

Evaluation of exercise and fitness among individuals with Neurological Disorders

- Treadmill testing
- Walking tests: Timed up and go, 6MWT
- Quality of life (HRQOL)
- Fatigue test (we will talk about it in the next lessons)
- Spasticity (we will talk about it in the next lessons)
- Exercise physiology parameters for assessing intensity of exercise (carvonan, ECG, RPE/BORG)

Karvonan formula

- Maximum HR- WOMEN 200-AGE, MEN -220-AGE
- Resting HR- monitored in the morning before you get out of bed or after 10 minutes of sitting
- Heart rate reserve is MHR- RHR
- Double it by intensity (%)
- Add resting HR

$$(HR \text{ max}-HR_{\text{rest}}) * \% \text{ intensity} + HR_{\text{rest}} = \text{Target HR}$$

RPE



Target Zone	% Intensity
Maximum VO ₂ Max Zone	90% - 100%
Hard Anaerobic Zone	80% - 90%
Moderate Aerobic Zone	70% - 80%
Light Fat Burn Zone	60% - 70%
Very Light Warm Up Zone	50% - 60%

RPE Scale	Rate of Perceived Exertion
10	Max Effort Activity Feels almost impossible to keep going. Completely out of breath, unable to talk. Cannot maintain for more than a very short time.
9	Very Hard Activity Very difficult to maintain exercise intensity. Can barely breath and speak only a few words
7-8	Vigorous Activity Borderline uncomfortable. Short of breath, can speak a sentence.
4-6	Moderate Activity Breathing heavily, can hold short conversation. Still somewhat comfortable, but becoming noticeably more challenging.
2-3	Light Activity Feels like you can maintain for hours. Easy to breathe and carry a conversation
1	Very Light Activity Hardly any exertion, but more than sleeping, watching TV, etc

BORG SCALE

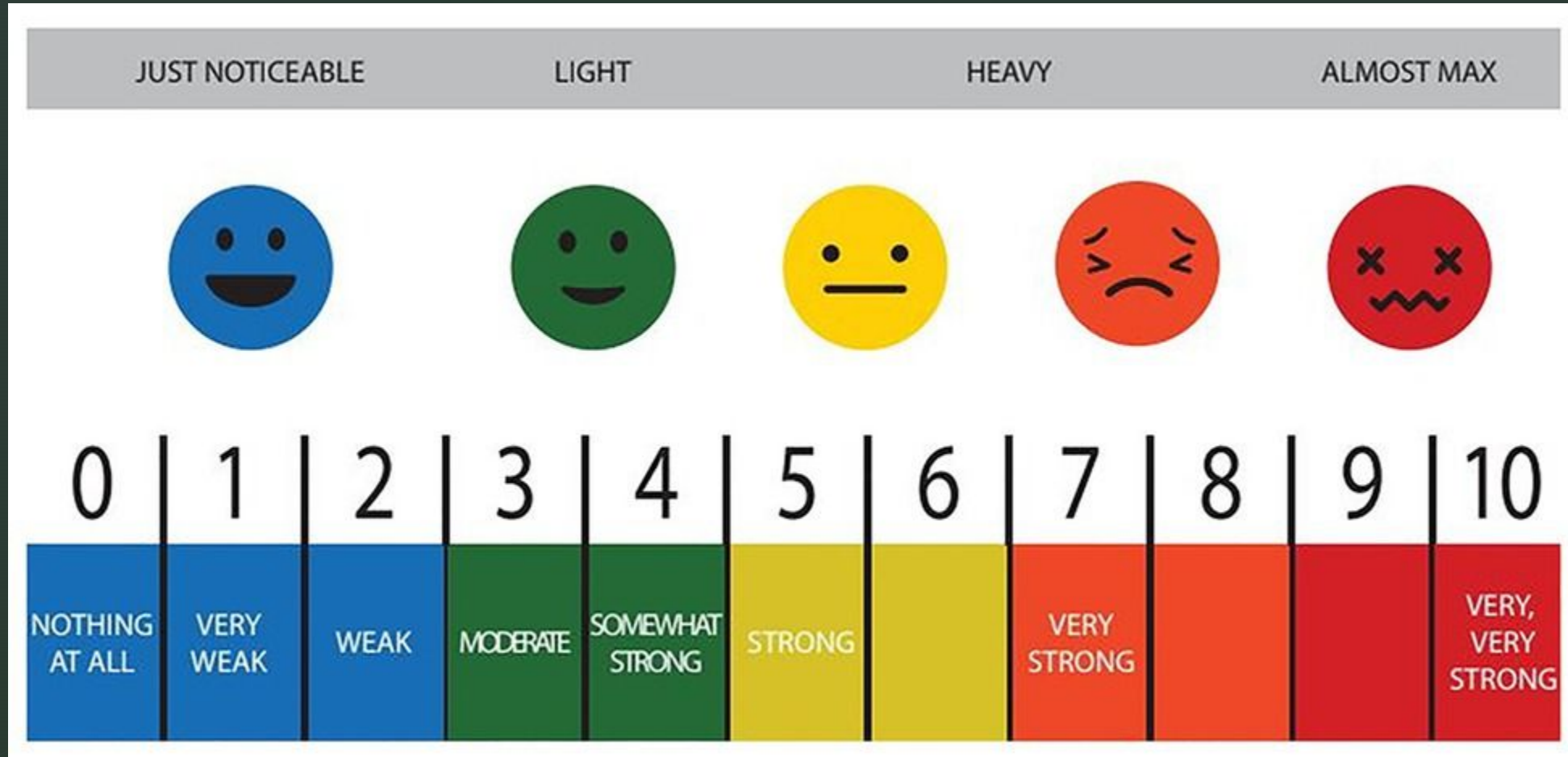
Under 35% of THR

50-74% of max THR

75-85% of THR

<i>Rating of Perceived Exertion Borg RPE Scale</i>		
6		How you feel when lying in bed or sitting in a chair relaxed. Little or no effort.
7	Very, very light	
8		
9	Very light	
10		
11	Fairly light	
12		Target range: How you should feel with exercise or activity.
13	Somewhat hard	
14		
15	Hard	
16		
17	Very hard	How you felt with the hardest work you have ever done.
18		
19	Very, very hard	Don't work this hard!
20	Maximum exertion	

Graphic version of the BORG Scale

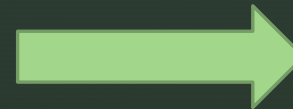


Fourth week	Third week	second week	First week	
				40-55% of Intensity
				55-70% of Intensity
				70-80% of intensity

Did you reach the THR?



If not, why?



What did you feel during the exercise and after ?