

PPT 11 – Exercise and Physical Activity



Physical inactivity

- In Canada at least 51% of adults are physically inactive
 - Inactivity increases with age
 - Women are less active than men
- 24 billion dollars spent every year in the US on health care costs related to inactivity
- Equally as damaging as obesity or smoking as a risk factor for chronic disease
- **Physical activity** – bodily movement produced by muscle contractions that substantially increase energy expenditure
- **Exercise** – Planned, structured, and repetitive bodily movement that promotes or maintains physical fitness
- **Training** – regular practice of an activity, which leads to physical adaptations of the body with improvement in flexibility, strength, or endurance

Benefits of Physical activity

- Moderate physical activity:
 - Live longer
 - More restful sleep
 - Better nutritional health
 - Improved body composition
 - Improved bone density
 - Enhanced resistance to colds and flus and other infectious diseases
 - Lower risk of cancer
 - Stronger circulation and lung function
 - Lower risk of cardiovascular disease
 - Lower risk of type 2 diabetes

Benefits of Physical activity

- Moderate physical activity:
 - Reduced risk of gallbladder disease (in women)
 - Lower incidence and severity of anxiety and depression
 - Stronger self-image
 - Better quality of life, for longer
 - ...many, many more

Physical Activity/Exercise

- How much?
- What type?
- What intensity?
- How often?

How Much Exercise?

- **Minimum cumulative daily 30 minutes**
 - However, DRI committee and other national authorities state that 30 minutes is not enough for adults to maintain healthy body composition (which would be important for health benefits)
- **150 minutes per week**
- Do not sit in 1 place for longer than 30 minutes at a time
 - Blood circulation is maintained through muscular contraction, especially in the legs
 - Blood clots – higher risk the longer sitting in 1 place without moving
- Canada's Physical Activity Guide:
<https://publications.gc.ca/collections/Collection/H39-429-1998-2E.pdf>

Other Physical Activity Guidelines for Canadians

- <https://csepguidelines.ca/>
- Canadian Society for Exercise Physiology publishes annual physical activity guidelines for Canadians.
- Participaction publishes a yearly report card on key markers of health related to physical activity.
- <https://www.participaction.com/en-ca/resources/adult-report-card>

CSEP-PATH: MOVEMENT COUNSELLING TOOL

FOR ADULTS AGED 18-64 YEARS

The Canadian 24-Hour Movement Guidelines for adults integrate three core movement behaviour recommendations for optimal health benefits:

MOVE MORE

**REDUCE
SEDENTARY TIME**

SLEEP WELL

Use this tool to guide your conversation with clients that express an interest in changing a movement behaviour.

STEP 1: ASK client for permission to discuss their movement behaviours (i.e., physical activity, sedentary time, sleep).

- “May I discuss Canada’s daily movement recommendations with you?”
- Discuss the Canadian 24-Hour Movement Guidelines with your client.

STEP 2: ASSESS client’s physical activity, sedentary time, and sleep.

- Ask open-ended questions such as “*Tell me about your current physical activity levels?*” or “*How would you describe your sleep schedule?*”
- Use the information gathered and the movement recommendations below to help guide goal setting and action planning (STEP 4).

A HEALTHY 24 HOURS INCLUDES:

PHYSICAL ACTIVITY	SEDENTARY TIME	SLEEP
 150 minutes per week of moderate to vigorous aerobic physical activities	 Limit sedentary time to 8 hours or less	 Get 7 to 9 hours of good-quality sleep on a regular basis
 Muscle strengthening activities at least twice a week	 No more than 3 hours of recreational screen time	 Consistent bed and wake-up times
 Several hours of light physical activities including standing	 Break up long periods of sitting as often as possible	
Replacing sedentary behaviour with additional physical activity and trading light physical activity for more moderate to vigorous physical activity, while preserving sufficient sleep, can provide greater health benefits.		

What do other countries recommend?

Physical Activity guidelines of few countries

Age group	WHO Guidelines		Physical activity guidelines-UK		Canadian Society for Exercise Physiology		Department of Health & Aging-Australia		CDC Guidelines on physical activity		Physical activity guidelines for Asian Indians	
	Duration	Intensity	Duration	Intensity	Duration	Intensity	Duration	Intensity	Duration	Intensity	Duration	Intensity
0-5 Years	None	None	Every day	Floor based play	Every day	Floor based play for toddlers Pre-schoolers 180 min spread throughout the day	Every day	Floor based play for toddlers Pre-schoolers 180 min spread throughout the day	60 min	gymnastics or push-ups, at least 3 days per week	None	None
5-17 years old	60 min daily	Moderate to vigorous intensity	60 min daily	Moderate to vigorous intensity	60 minutes / Day	Moderate to vigorous intensity	60 min/ day	Moderate to vigorous intensity			60 min / day	Moderate to vigorous intensity
18-64 years old	150 min per week / 70 min week	Moderate / vigorous / combination of both	150 min per week / 70 min week	Moderate / vigorous / combination of both	150 minutes / week	Moderate to vigorous intensity	60 min/ day	Moderate to vigorous intensity	150 minutes/ week	Moderate intensity vigorous intensity	60 min / day	Moderate intensity
65 years and above	150 min per week / 70 min week	Moderate / vigorous / combination of both	150 min per week / 70 min week	Moderate / vigorous / combination of both	150 minutes / week	Moderate to vigorous intensity	30 min/ day	moderate intensity	75 minutes/ week		60 min / day	Moderate intensity

Intensity of Exercise

Definitions of Physical Activity Intensity – Consensus Physical Activity Guidelines for Asian Indians

- ***Low-intensity:*** “activity elicits a slight increase in breathing rate and is relative to a given person”
- ***Moderate-intensity:*** “activity elicits a moderate, noticeable increase in depth and rate of breathing, while still allowing comfortable talking and is relative for a given person”
- ***Vigorous-intensity:*** “activity elicits a noticeable increase in depth and rate of breathing, will not be able to allow more than a few words without pausing for a breath”

Another way to gauge intensity - METs

- **A MET is a ratio of your working metabolic rate relative to your resting metabolic rate.**
- One MET is approximately 3.5 milliliters of oxygen consumed per kilogram of body weight per minute.
- One MET is the energy you spend sitting at rest — your [resting or basal metabolic rate](#). So, an activity with a MET value of 4 means you're exerting four times the energy than you would if you were sitting still.
- The American Heart Association (& many other groups) recommends at least 150 minutes of moderate-intensity aerobic exercise each week for optimal cardiovascular health. That's equal to about 500 MET minutes per week, according to the Dept. Of Health & Human Services.
- **Converting METs to calories:** The formula to use is:
METs x 3.5 x (your body weight in kgs) / 200 = calories burned per minute.
- <https://youtu.be/9ma8MJXuxMs>

Light < 3.0 METs	Moderate 3.0–6.0 METs	Vigorous > 6.0 METs
Sitting at a desk: 1.3	Housework (cleaning, sweeping): 3.5	Walking at very brisk pace (4.5 mph): 6.3
Sitting, playing cards: 1.5	Weight training (lighter weights): 3.5	Bicycling 12–14 mph (flat terrain): 8
Standing at a desk: 1.8	Golf (walking, pulling clubs): 4.3	Circuit training (minimal rest): 8
Strolling at a slow pace: 2.0	Brisk walking (3.5–4 mph): 5	Singles tennis: 8
Washing dishes: 2.2	Weight training (heavier weights): 5	Shoveling, digging ditches: 8.5
Hatha yoga: 2.5	Yard work (mowing, moderate effort): 5	Competitive soccer: 10
Fishing (sitting): 2.5	Swimming laps (leisurely pace): 6	Running (7 mph): 11.5

What Type of Exercise?

- **Flexibility** – the capacity of the joints to move through a full range of motion; the ability to bend and recover without injury
- **Muscle strength** – the ability of the muscles to work against resistance
- **Muscle endurance** – the ability of a muscle to contract repeatedly within a given time without becoming exhausted
- **Cardiorespiratory endurance** – the ability to perform large-muscle dynamic exercise of moderate to high intensity for prolonged periods
- **Overload** – an extra physical demand placed on the body; an increase in the frequency, duration, or intensity of an activity. A principle of training is that for a body system to improve, it must be worked at frequencies, durations, or intensities that increase by increments

What Type of Exercise?

- **Hypertrophy** – an increase in size in response to use (eg. Muscle size)
- **Atrophy** - a decrease in size due to disuse ie. With paralysis, casting etc.
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- **Myoglobin** – the muscles' iron-containing protein that stores and releases oxygen in response to the muscles' energy needs
- **Weight training** – the use of free weights or weight machines to provide resistance for developing muscle strength and endurance. A person's own body weight may also be used to provide resistance as when a person does push-ups, pullups, or situps. Also called resistance training.

What Type of Exercise?

- **Cardiac output** – the volume of blood discharged by the heart each minute
- **Stroke volume** – the amount of oxygenated blood ejected from the heart toward body tissues at each beat
- **VO2Max** – the maximum rate of oxygen consumption by an individual (measured at sea level)
- **Lactic acid** – a compound produced during the breakdown of glucose in anaerobic metabolism. Causes soreness post-workout in muscles and pain during high intensity exercise
- https://youtu.be/8Y_Fdjl2v4I

Aerobic vs Anaerobic exercise

- **Aerobic** – requiring oxygen. Aerobic activity strengthens the heart and lungs by requiring them to work harder than normal to deliver oxygen to the tissues
- **Anaerobic** – not requiring oxygen. Anaerobic activity may require strength but does not work the heart and lungs very hard for a sustained period

Endurance/Cardiorespiratory Exercise

- Aerobic in nature
- Body learns to deliver oxygen more efficiently to tissues
- Total blood volume and number of red blood cells increase
- Heart becomes larger and stronger
- Cardiac output increases
- Heart stroke volume increases
- Resting heart rate decreases
- Muscles that inflate and deflate the lungs are strengthened and so breathing becomes more efficient
- Blood pressure is maintained in the normal range
- HDL increases

Endurance/Cardiorespiratory Exercise

- How conditioned is your heart? Take your resting pulse.
 - Sit relaxed for 5 minutes before taking your pulse for 15 seconds. Multiply this number by 4. Ideally take this when you wake up in the morning before getting out of bed for the most accuracy.
 - **Exercise Heart Rate Zones:**

Lower-intensity zone: You're exercising at 50% to 60% of your max heart rate. At this point, 85% of the calories you burn are fat. The downside? You're burning fewer calories overall than you would if you were exercising at a higher intensity. You're generally able to sustain this zone the longest amount of time.

Temperate zone: You're exercising at 60% to 70% of your max heart rate. Roughly 65% of the calories you burn are fat.

Aerobic zone: Working at 70% to 80% of your max heart rate puts you in the aerobic zone. About 45% of the calories you burn are fat. But you're burning a higher number of overall calories compared to the other heart rate zones. You generally sustain this zone the shortest amount of time.

Maximum Heart Rate: $220 - \text{your age}$ ie. For a 35 year old, $220 - 35 = 185$

If you want to be in the temperate zone, you would aim for $185 \times 0.70 = 130$ bpm

<https://youtu.be/0on5LV3k26o>

Muscle Strength

- Muscles increase in strength by responding to an overload of physical activity and gain strength and/or size (called hypertrophy)
- Takes a day or two to repair muscle tears and replenish energy stores
- Recommended 2-4 times per week
- For increased strength, heavier weights, lifted with less repetitions
- For increased endurance, lighter weights, lifted with more repetitions
- Prevents injury
- Prevents limited mobility that accompanies ageing
- Increases bone mass and density

Flexibility

Maintains range of motion and functional movement

- Prevents injury
- Typically, a stretch must be held for about 10 - 30 seconds for benefit
- Sitting all day will cause hip flexors to shorten – stretching can help

Decreases joint pain

The latest ACSM stretching and flexibility guidelines include:

Frequency:

Equal to or greater than 2–3 times per week.

Daily stretching is most effective.

Intensity:

Stretch to the point of feeling tightness or slight discomfort.

Time:

Holding a static stretch for 10–30s is recommended for most adults.

In older individuals, holding a stretch for 30–60s may confer greater benefit toward flexibility.

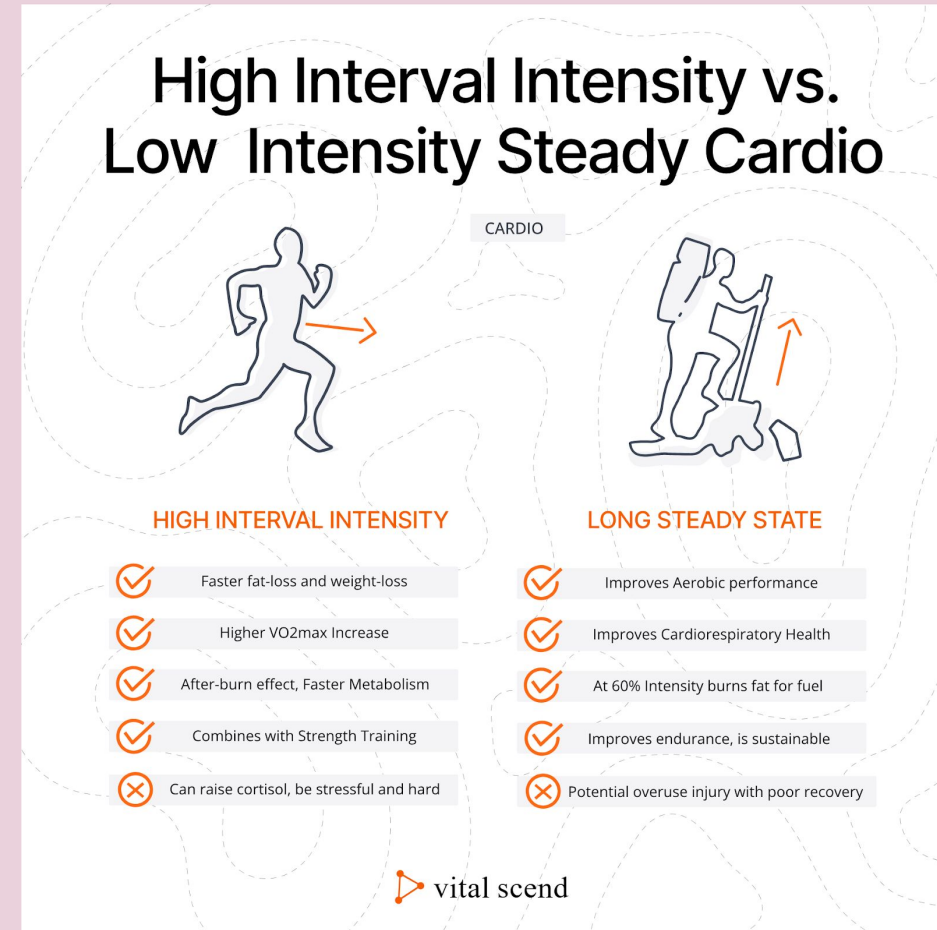
Type:

A series of flexibility exercises for each of the major muscle–tendon units is recommended.

Current Topics in Exercise Physiology

- HIIT training

- High intensity interval training: alternating high intensity periods of intense anaerobic exercise (80 - 100% max heart rate) with recovery periods.
- No one regime or strategy, often uses a 2:1 ratio, such as 40 sec exertion, 20 sec rest
- Compared to LISS (low intensity steady state), HIIT burns less fat for fuel during exercise



HIIT vs LISS

- Post-exercise oxygen consumption (EPOC) increases therefore more fat burn post exercise over a 24 hr period
- However, recent meta analyses of research studies seem to show that total calories, & total fat burn are pretty equivalent between the two types of exercise
- So why choose HIIT?
 - More time efficient 10 min HIIT = 50 min moderate cycling workout
 - Greater increases in max heart rate
 - Increased insulin sensitivity

Who should be cautious of HIIT? – Those with cardiovascular conditions

- “weekend warriors” - people with poor flexibility (increased chance of injury)

Examples of HIIT workouts: Tabata, full body HIIT, resistance training, interval training on cardio equipment

Bottom Line: Ideally incorporate both HIIT and LISS (Low Intensity Steady State) workouts

Other Current Topics in Exercise Physiology

- Wearable Technologies
 - Body Weight Training
 - Virtual/Online Training
 - Fitness Programs for Older Adults
 - Exercise as Medicine
 - Lifespan/Healthspan longevity
 - Exercise connection to healthy brains/alzheimers prevention
 - Vibration training
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- Fasted vs Fed exercise
 - <https://youtu.be/UF0AkfJqq2s>

Resources

- asep.org
- <https://csep.ca/>