

Moderate Exercise

Improving Mental & Physical Health

Discussion with the Ottawa Lymphoma Support Group

March 3, 2020

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Outline

- **Benefits of exercise for cancer survivors**
- **Degrees and types of exercise**
- **Simple forms and measures**
- **Forms, tools & measures for the more serious**
- **Summary & discussion**

Why Exercise?

*“Mens sana in
corpore sano”*



Juvenal – Satire X, about 120 AD

Why Exercise?

Strong Evidence of Health Benefits

- **Exercise Guidelines for Cancer Survivors**
- **International Multidisciplinary Roundtable - 2019**
- **Summarizes over 2,500 published controlled trials**
- **Examines effects of moderate to vigorous exercise**
- **“Exercise treatment is safe and well tolerated during and after cancer treatment”**



Healthy Body

Strong evidence

- Physical fitness
- Physical function
- Health-related Quality of Life
- Cancer-related fatigue
- Lymphedema (especially in breast cancer)

Moderate evidence

- Bone health



Healthy Body

Further study needed

(some trials positive)

- **Cardiotoxicity**
- **Chemo induced Peripheral Neuropathy**
- **Falls**
- **Nausea**
- **Pain**
- **Sexual function**
- **Treatment tolerance**



Healthy Mind

Strong evidence

- Anxiety
- Depressive symptoms

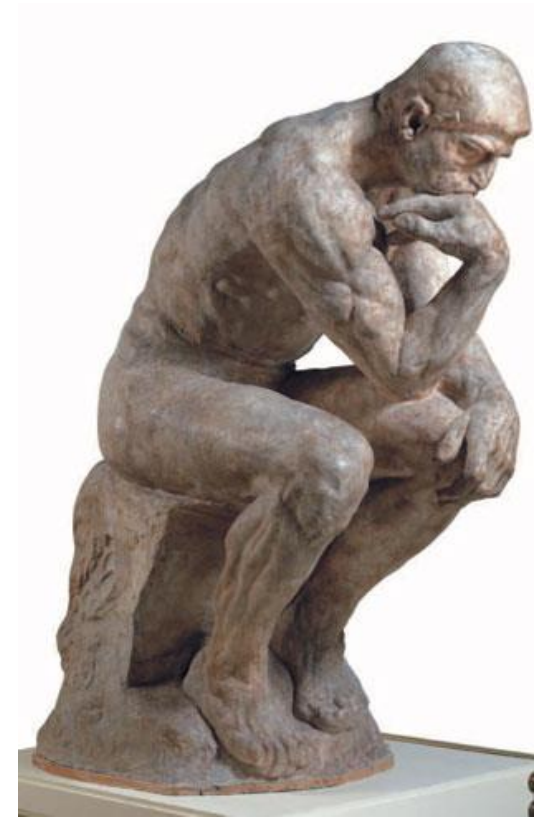
Moderate evidence

- Sleep

Further study needed

(some trials positive)

- Cognitive Function

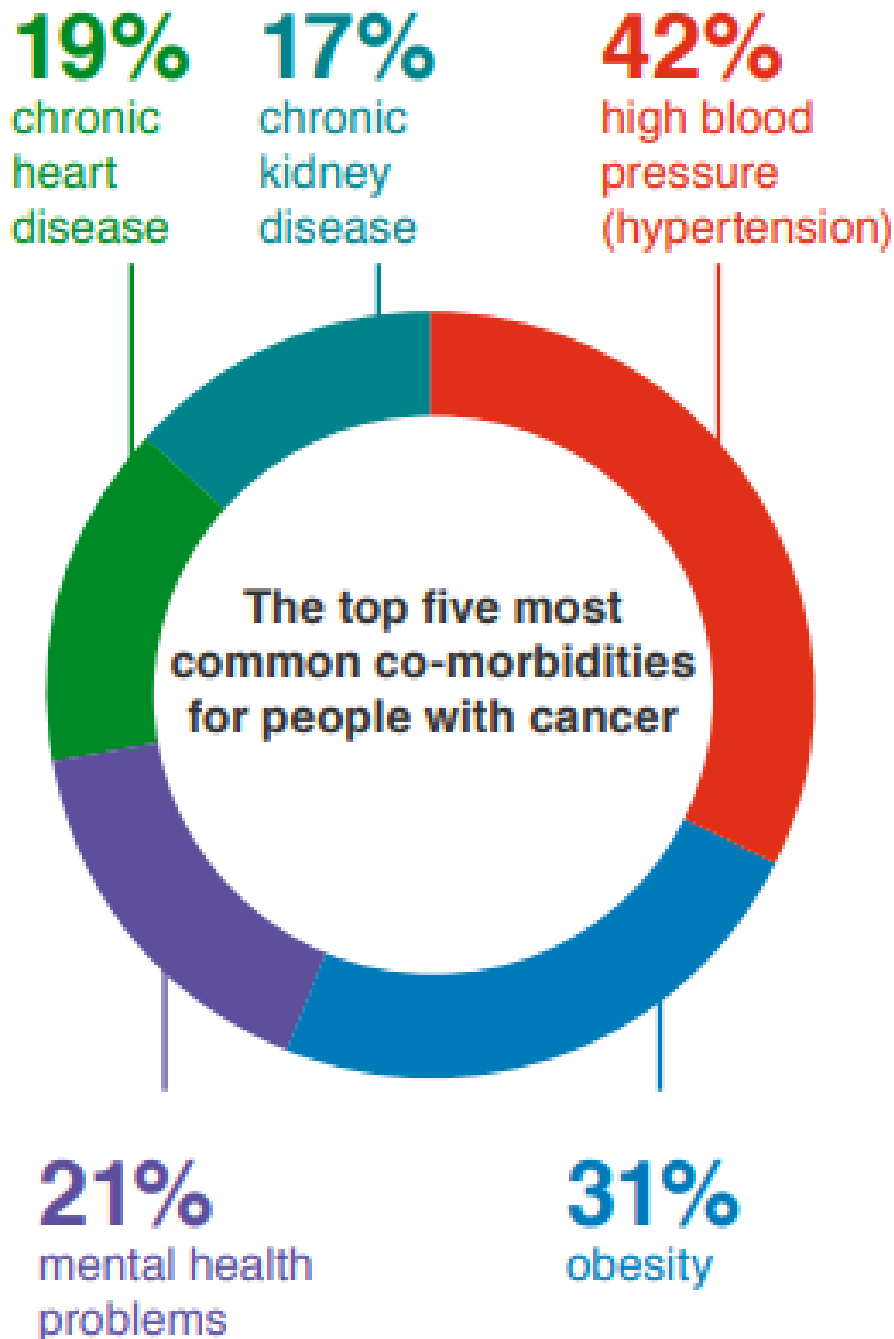


Moderate to vigorous
exercise,
like brisk walking,
cut risk of death up to

70%
among older women

Source: Circulation, Nov. 6, 2017; Accelerometer-Measured Physical Activity
and Sedentary Behavior in Relation to All-Cause Mortality; I-Min Lee.





Caution

Be sure you are medically fit to exercise

“No assessments are required to start low-intensity aerobic training, resistance training with gradual progression, or a flexibility program in most survivors.”

How Much Exercise?

Canadian Society for Exercise Physiology
For Adults 18 years and older:

- 150 Minutes of Moderate to Vigorous aerobic activity/week
- Sessions of at least 10 minutes each
- Extra muscle & bone strengthening activities 2 days/week
- More is better up to a point...
- (A later section will give some guidelines to that point)



This is a TARGET

- You don't start there
- You work your way up.



“Moderate to Vigorous” Exercise?

Mayo Clinic

Moderate exercise intensity

- Your breathing quickens, but you're not out of breath
- You develop a light sweat after about 10 minutes
- You can carry on a conversation, but you can't sing

Vigorous exercise intensity

- Your breathing is deep and rapid
- You develop a sweat after only a few minutes
- You can't say more than a few words without pausing for breath



Overexerting yourself

- Beware of pushing yourself
 - Too hard
 - Too often
- If you are
 - Short of breath,
 - In pain
 - Can't work out as long as you'd planned



Your exercise intensity is probably higher than your fitness level allows

Back off a bit and build intensity gradually

How hard am I working?

Simplest indicator:

Using Heart Rates

- Sensing dizziness
- By hand
- Chest strap
- Exercise machine handles
- Smart watch



Heart Rate Guidelines

Age	Moderate 50-70%	Vigorous 70-85%	<u>Average</u> Maximum 100%
20	100-140	140-170	200
30	95-133	133-161	190
35	93-130	130-157	185
40	90-126	126-153	180
45	88-122	122-149	175
50	85-119	119-145	170
55	83-115	115-140	165
60	80-136	112-136	160
65	78-108	108-132	155
70	75-105	105-128	150

Based on the rough standard of 220 minus your age

Health consequences

Overweight & obesity

World Health Organization:

A raised BMI is a major risk factor for

- **Cardiovascular diseases (mainly heart disease and stroke)**
 - **The leading cause of death in Canada (over 30%)**
- **Diabetes**
- **Musculoskeletal disorders (especially osteoarthritis)**
- **Some cancers**
 - **Including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon).**



Weight and Health

Are you Overweight or Obese?

- Body Mass Index (BMI) the most common rough standard
- Dual Energy X-Ray Absorptiometry (DEXA) the most precise
- Hydrodensitometry reasonably accurate
- Smart scale % fat
- Online standards available:
 - Waist measurements
 - Skinfold calipers



Body Mass Index (BMI)

$$\text{Weight(Kg)} / (\text{Height(m)}^2)$$

Healthy BMI = 20 to 25

Example:

86 kg at 1.8 m = 27 BMI

In 2019:

- 21% of Canadian adults are obese
- Over half are overweight

		Weight (Kg)															
		41	45	50	54	59	64	68	73	77	82	86	91	95	100		
Ht	144,2	20	22	25	27	29	31	34	36	38	40	43	45	47	49		
	144,7	19	22	24	26	28	30	32	35	37	39	41	43	45	48		
	147,3	19	21	23	25	27	29	31	33	36	38	40	42	44	46		
	149,8	18	20	22	24	26	28	30	32	34	36	38	40	42	44		
	1,4	18	20	21	23	25	27	29	31	33	35	37	39	41	43		
	1,9	17	19	21	23	25	26	28	30	32	34	36	38	40	42		
	1,4	16	18	20	22	24	26	27	29	31	33	35	37	38	40		
	1,0	16	18	19	21	23	25	27	28	30	32	34	35	37	39		
	1,5	15	17	19	21	22	24	26	27	29	31	33	34	36	38		
	1,1	15	17	18	20	22	23	25	27	28	30	32	33	35	37		
1,6	15	16	18	19	21	23	24	26	27	29	31	32	34	36			
1,1	14	16	17	19	20	22	24	25	27	28	30	31	33	34			
1,2	14	15	17	18	20	21	23	24	26	27	29	30	32	33			
175,2	13	15	16	18	19	21	22	24	25	27	28	30	31	33			
177,8	13	14	16	17	19	20	22	23	24	26	27	29	30	32			
180,3	13	14	15	17	18	20	21	22	24	25	27	28	29	31			



UNDERWEIGHT



HEALTHY



OVERWEIGHT



OBESE



EXTREMELY
OVERWEIGHT

Diet and Obesity

- **Ultra-Processed Foods and Beverages make up 45% of Canadian adult daily calories**
- **Consumption higher among:**
 - Young men
 - Less educated people
 - Smokers
 - Physically inactive people
 - Canadian-born individuals



Top fifth of ultra-processed food consumers are 32% more obese than the bottom fifth

How much energy does exercise burn?

The increase in Basal Metabolic Rate (BMR) associated with various activities

- Average BMR for American women is 1,400 calories/day (60/hr)
- Average BMR for American men is 1,800 calories/day (75/hr)

Metabolic Equivalent Tasks (METs):

Physical Activity

Light Intensity

- Sleeping
- Watching TV
- Writing, desk work
- Strolling 3 kph
- Walking 4 kph

METs

<3

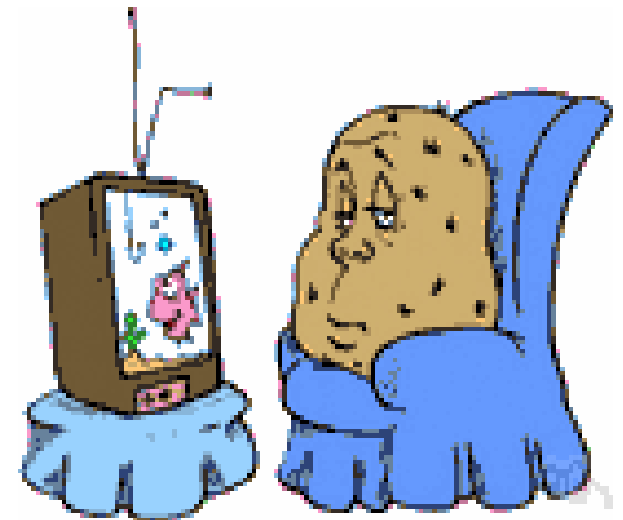
0.9

1.0

1.8

2.5

2.9



METs

Moderate Intensity

- Stationary bike - low effort (50 watts)
- Walking 5 kph
- Moderate calisthenics
- Walking 6 kph

3-6

3.0

3.4

3.5

4.0



Vigorous Intensity

- Jogging
- Heavy calisthenics (sit-ups, pull-ups...)
- Running
- Rope jumping

≥6

7.0

8.0

8+

10



FAMILIAR RUNNING FORM



GOOD RUNNING FORM



More “Moderate” exercise examples:

- Walking two miles in 30 minutes
- Biking five miles in 30 minutes
- Swimming laps for 20 minutes
- Running one and a half miles in 15 minutes
- Doing water aerobics for 30 minutes
- Playing volleyball for 45 minutes
- Playing pick-up basketball for 20 minutes
- Walking stairs for 15 minutes
- Washing your car for an hour
- Gardening for 30 to 45 minutes
- Raking leaves for 30 minutes
- Dancing for 30 minutes



Where your exercise gets its energy:

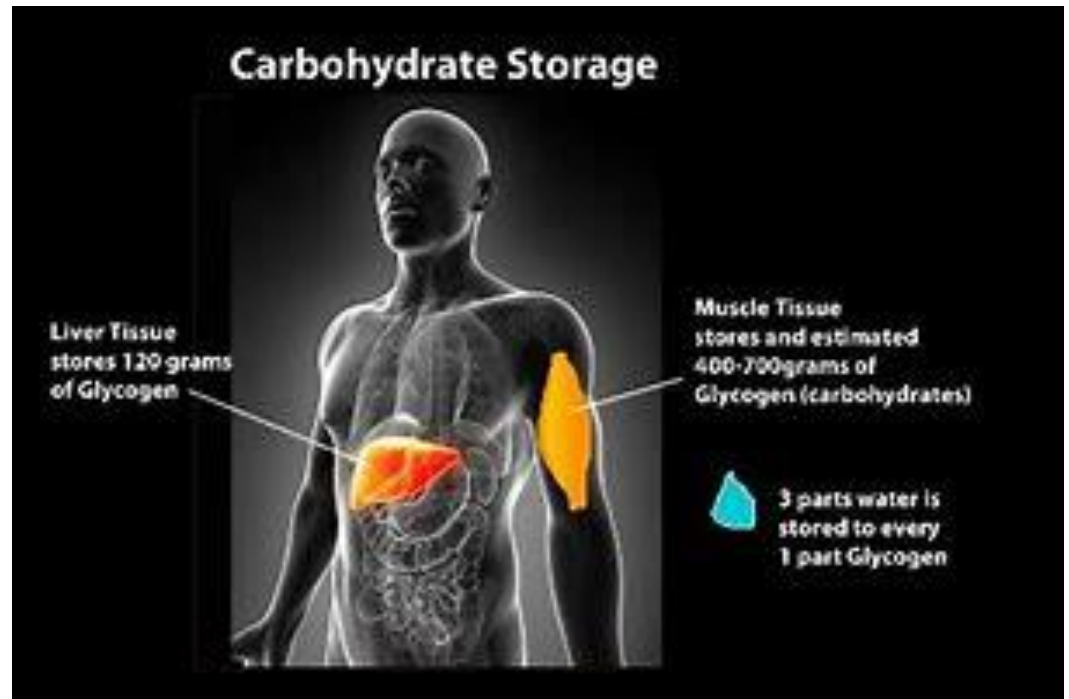
(Example is for a 60-year old, but it applies broadly)

Intensity (%MHR)	Heart Rate bpm	% Carbohydrate	% Fat	
65-70	104-112	15	<u>85</u>	<u>Burns Fat</u>
70-75	112-120	35	<u>65</u>	

75-80	120-128	<u>65</u>	35	
80-85	128-136	<u>80</u>	20	<u>Burns Carbs</u>
85-90	136-144	<u>90</u>	10	
90-95	144-152	<u>95</u>	5	
100	152-160	<u>100</u>	0	

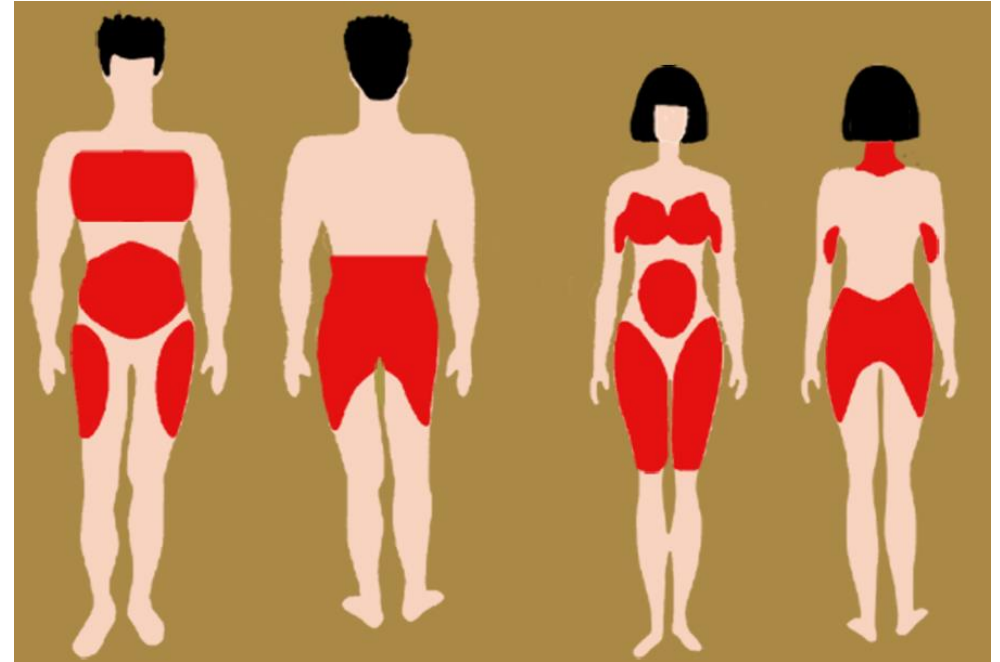
Carbohydrate metabolism

- Carbs stored in liver and muscles
- Stored as glycogen
 - Readily converted to energy (ATP)
 - Storage increases with training
 - “Carbo loading” is a short term increase
 - The first and only source of high-intensity energy
 - Carbo depletion called “hitting the wall”



Lipid (fat) metabolism

- A major source of energy (ATP)
- Much harder to metabolize than glycogen
- The low-energy reserve left after “hitting the wall”
- Male and female distributions differ
- Visceral fat is an organ
 - Source of hormones
 - Pro-inflammatory
 - Can become a chronic support for
 - Atherosclerosis
 - Diabetes



Benefits of short, high intensity intervals

- Strong improvement in cardiovascular fitness
 - Increase in hemoglobin
 - Increase in muscular mitochondria
 - Increase muscular hormone output
 - Bone strengthening
 - Reduces incidence/severity of falls
- Epigenetics:
 - DNA methylation is a strong factor in ageing
 - Decreases cellular metabolism
 - Reduced by exercise (one-legged cyclists)
- Increases Brain Derived Neurotrophic Factor (BDNF)
 - Stimulates neurogenesis and improved cognition

Personal Experience and Recommendations

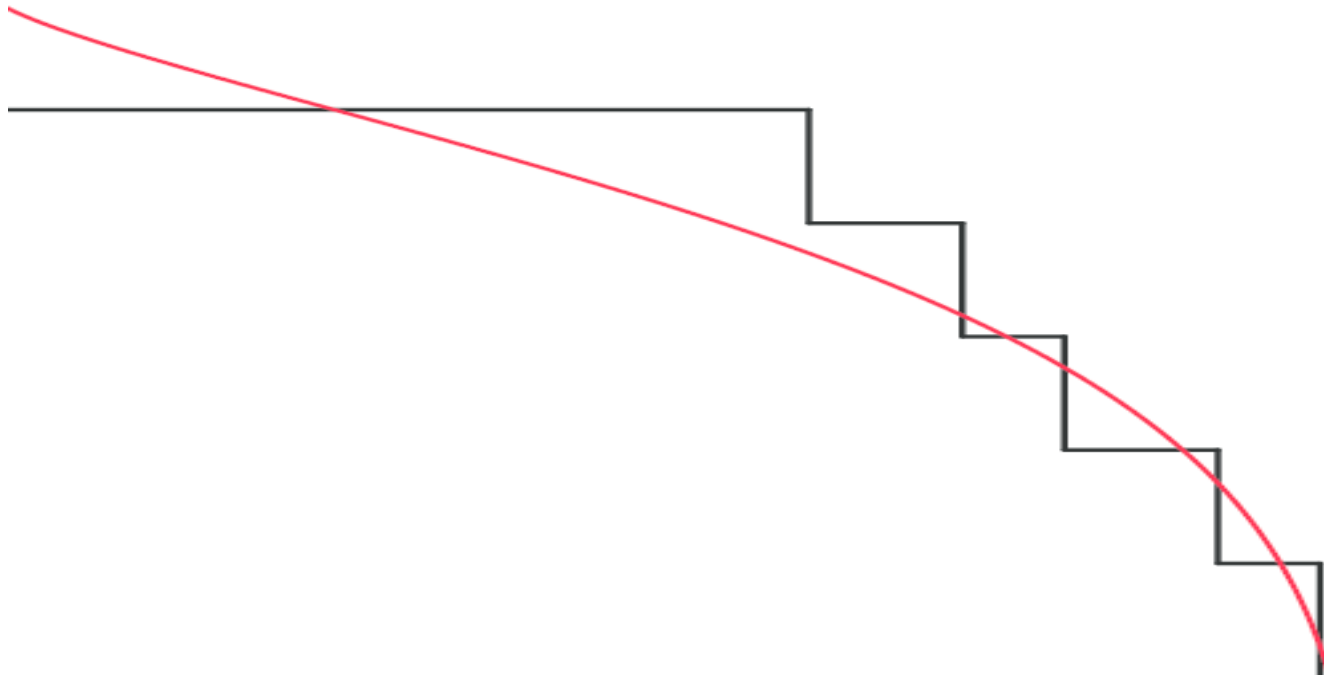
Prophylactics

- **Stretching/Yoga/Pilates**
- **Selecting appropriate forms of exercise**
- **Strengthening less-used muscles**
- **Core exercises for back health**
- **Incorporating regular rest periods**
- **Try not to miss two days in a row**
- **“Pushing the envelope” gently**
- **Warm up and cool down**
- **“Sitting kills”**

(Mis)-Step Function

Health deterioration with ageing:

- Not a smooth downward curve
- A series of illnesses and injuries cause losses of fitness
- Full recovery is never achieved



“That which is measured improves”

Tools

- Log
- Chest band
- Smart watch
- Tracking apps
- Measured distances (off concrete)
- Smart scale
- Fitness equipment
- Standing desk
- Simple
 - Stretch band
 - Skipping rope
 - Mat
 - Bar bells
- Home gym



Simple log

DATE	ACTIVITY	COMMENTS	KG
Jan 14 to Feb 07	Mexico	not much exercise	64.8
Feb 10	treadmill 1h	6 + 5.2 kph	65.6
" 12	walk in Gatineau	2h on snow	
" 14	treadmill 45 min	stiff legs	
" 18	treadmill 1h	6 + 5.6	
" 19	Gatineau	2h - easy	
" 20	walk to Byward market	easy	
" 22	treadmill 1h	6 + 5.6	
" 24	walk to dentist	2 km	
" 25	walk to Nat'l Gallery.		
" 26	Gatineau	2h - long slog	
" 27	walk to Billings Bridge	6 km	
" 28	"	"	
" 29	∅		65.4

More complex log

- Exercise, Resting H/R, Weight, BMI, Core exercises, activity

2020	Day	7 D	Comments	Min Pulse	Wt. Kg	BMI	Core	Equiv Km	
	1-Jan	9	63	8 at 5.7	51		90;4BB;60,40C	11	
	2-Jan	0	53	Day off	49			3	
	3-Jan	10	54	Errands	48	88.7	27.4	9	
	4-Jan	12	59	10 at 5.7	48		90;4BB;40C	14	
	5-Jan	8	61	7 at 5.7	45			12	
	6-Jan	10	60	Paint at Preston again	45			9	
	7-Jan	10	59	9 at 5.7	50	87.3	26.9	90 5BB;0,40C	13
	8-Jan	4	54	Chores & Loblaw's	50			7	
	9-Jan	12	66	11 at 6	50		100;6BB;70,30C	15	
	10-Jan	10	66	8 at 5.7	48			15	
	11-Jan	0	54	Driving to Roanoke	49			3	
	12-Jan	14	60	Top Mt Roanoke	49			17	
	13-Jan	17	67	Chestnut Rg w Chuck	50			20	
	14-Jan	0	57	Driving from Roanoke	53			4	
	15-Jan	8	61	7K at 5.8 plus chores	51	86.5	26.7	100;4BB;2X50C	12
	16-Jan	9	58	To and from IVIG	53			14	
	17-Jan	8	56	Very gentle - all at 5.0	53		100;4BB;70,30C	12	
	18-Jan	0	56	Day completely off	51			3	
	19-Jan	13	55	11: 5% to 7, 1/2% Off	48		100;4BB;60,40C	15	

Exercise monitoring



Calories

866_{Kcal}



Distance

11.75_{Km}





Activity duration

03_H01_{Min}

Heart Rate monitoring




resting
heart rate
58_{BPM}


Average
heart rate
62_{BPM}


Max HR
110_{BPM}

Sleep monitoring



Making time

- Hamster vs. couch potato
- Regular routine
 - Walk, don't drive
 - (Safe) stairs vs. elevator/escalator
 - A failing memory has its advantages
- Social involvement
 - Running Room
 - Hiking Clubs
 - Aquatics
 - R.A Centre
 - Fitbit
 - Peloton
- Local Events
 - Charity Walks/Runs
 - Ski Loppets



Summary

- Exercise is beneficial to cancer patients
- Basic is simple, moderate & regular
- More serious: Carefully controlled
- Tools are available but not essential
- Social involvement is helpful
- Goal: Best Quality of Life possible

If you aren't enjoying it, you're doing it wrong!

Appendix for Runners

Specific Suggestions for training for a half-marathon:

- *In general, one should not race farther than 3 times one's average daily running distance. That leads to the "Min weekly distance" below.*
- *In order to improve the vascularization of your muscles, the concentration of mitochondria per muscle cell, your ability to metabolize fats etc. you should run somewhat more than one hour religiously once per week for at least 8 weeks before the event (the "Long run" below).*
- *You should also run at least one quality run at a pace slightly (but just slightly) faster than your target pace. Running is a learned muscular skill, so you develop maximum efficiency in a fairly narrow range around your training pace – slightly slower than your tempo runs and slightly faster than your cruising pace on your long run.*
- *The quality run will be the only time you run below your aerobic threshold. By extending the quality distances gently as described below, you are going to enable yourself to run aerobically at ever-faster speeds.*
- *The outline below has only 10% quality (Tempo) running, where you do regular intervals at the Tempo pace, with gentle recovery jogs to get your pulse back under 120 or so in between. You could increase that to 15%, but you get diminishing returns and incur higher risk of injury as the stress from quality and long running increases.*
- *The Tempo running should start out at, say, six one Km intervals where you don't look at a watch until you reach the end point and adjust your pace to make each subsequent one as close to the target time as possible. You will probably find the first few intervals almost too easy, but the last ones tough – don't force yourself to do too many too early.*
- *It is well worth getting a large set of known distances so that you can get variety in your quality running.*

- *As you improve, you increase the length of the intervals so that before the race you may be running your tempo pace for two times 3Km if you can work up to that by going through a series of intervals gradually increasing in length while decreasing in number.*
- *Make sure you have a long enough gentle jog after hard runs to clear as much lactic acid out of your muscles as possible or it will damage your tendons by tightening up the muscles overnight*
- *I believe that two runs per week where you push the envelope a bit (one long, one fast) is about right, with the day right after the long or hard run a gentle one to help with recovery. The other days can be any sort of time on your feet – social at any slower speed is fine, for example.*
- *You should try not to miss more than one day at a time if you wish to improve continuously – I think of two days off as a bit of a step back.*
- *I tried to sketch out some rough numbers in the table below, but they should be taken as only a very rough guide. Your own body will tune your training level as you gain experience along the way.*

Typical Training Numbers:

<i>Half marathon (Km)</i>	21.1
<i>Target pace (for 1 Hr 50 Min half marathon)</i>	5'20"/Km
<i>Tempo pace (For quality runs)</i>	5'00"/Km
<i>Cruising pace (For long runs)</i>	5'40"/Km
<i>Min Weekly distance</i>	
<i>Typical week:</i>	50 Km
<i>Long run @ Cruising pace</i>	15Km
<i>Tempo run</i>	10Km (5&5)
<i>"Time on feet" running</i>	25 Km

Aside from the above general advice, I think there are several things to emphasize at your current stage:

- **Do not overdo anything (speed or distance) over the last 4 weeks. At this stage, you want everything you do to be building you up, not wearing you down. You can do yourself much more harm by overdoing the last four weeks than you can possibly gain by pushing right up to the limit.**
- **The whole idea of the “time on feet” running is to build up your general adaptation to running while minimizing the stress on your feet, ankles, knees... In order to give your body time to adapt to the stresses of the long run and quality run each week, you need these gentle, restorative runs.**
- **You should also count the number of times your left foot hits the ground in one minute while you are running at your long run cruising speed. You should have a cadence of about 85 per minute – anything slower means your strides are too long and slow. Shorter, quicker strides give you the same speed but decrease the stress on your joints (especially your lower legs). The longer stride causes your heel to land slightly in front of your knee, creating an impact that passes right up through your feet and legs. The shorter stride causes you to land your heel directly under your knee and greatly decreases the impact.**
- **It is important that your upper body remain at a constant angle to the ground. Many people lean into hills on the way up and lean back on the way down. That distorts their leg action and also increases foot impact.**

Do keep in mind that the whole purpose of the exercise is to enjoy your running, so don't get too wound up in numbers and targets. They will improve just fine if you stay healthy and run with joy.