Exercise: Putting the brakes on aging

Embrace Aging Month
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“Your doctor can only do so much. The rest is up to you. Stop getting older.”
Objectives

1. Exercise is good for you but, age, health, physical condition may make it difficult to participate.

2. Curiosities and concerns about exercise

3. Exercise; how often, how hard, how long, and what should you do

4. Exercise is a most potent anti-aging and disease modifying therapy, so why are we not exercising enough to reap the benefits of fitness in old age?

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Age-associated decline of aerobic capacity

(Stahokotas et al. 2010)
Aging – life gets tougher

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![Image of a graph showing VO2 levels over age years with different activities and percentages]

- **Walk Staircase**: 100%
- **Walk level 7km/hr, 116m/min**: 75%
- **Domestic Work (vacuum, mow lawn, make beds)**: 50%
- **Dressing**: 25%
Age-associated decline of muscle

Age-related changes in muscle mass in thigh cross-sectional area of two people with similar BMI.
Poor Fitness Directly Related to Functional Dependence

Exercise Types
- Aerobic
- Strength
- Balance
- Flexibility
- Body Type

Fitness Components
- Cardiorespiratory Fitness
- Morphology
- Muscular Performance

Outcomes
- Pathology

Functional Dependence

(Morey et al., 1998)
Odds of becoming functionally dependent over 8-yrs for each fitness group [low fitness to high fitness]

Paterson et al. (2004)
What Makes a 97-Year-Old Man Cycle 5,000 km a Year?

Gerontology, 2016

Fig. 1. I.K. at the age of 91 at the World Masters Athletic Championships (2009, Lahti, Finland). Photo: Ken Stone/Mastertrack.com.

Deficits
- Prostate Cancer
- Hypothyroidism
- Hypogonadism
- Popliteal Thombosis

Assets
- Muscle
- Cognitive function
- High levels of physical activity
- Social Interaction

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Frailty = Poor Fitness
[age-associated physiological decline]
Extensive evidence for the exercise pill

- Prevention and therapy for most chronic diseases
- Exercise as effective as medication
  - Select cases more effective or additive effect
- Long-term exercise participation reduces dependency risk by 60%
- All age cohorts improve functional capacity with exercise (65-100+)

(Paterson, Jones, Rice, 2007)
Type 2 Diabetes Has Been "Reversed" in 40% of Patients for 3 Months
March 16, 2017

- 8 weeks or 16 weeks respectively – where they were given personal exercise plans, meal plans that lowered their calorie intake by 500 to 750 calories a day, and regular meetings with a nurse and dietitian.

- 11 out of 27 patients (40%) in the 16-week intervention group showed complete or partial diabetes remission, as did six out of 28 individuals (21%) in the eight-week group.
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Exercise

Physical Activity

(Courtesy of Naoto Miyako, Japan, 2016)

(WALKING IN TREADMILL DRAWS WATER)

POPULAR SCIENCE, 1933
Brakes yes, but not a full stop!

(Etta Clark: Growing Old is Not for Sissies I & II)
Aging is a complex interaction between primary and secondary factors.

Normal Aging
Similar across the species
• Puberty, menopause, andropause

Chronic Disease
Clinical syndrome
• Multi-morbidity
Aging

Primary Aging
- Age
- Heart function
- Lung function
- Blood vessel stiffening
- Sacropenia
- Sensory deficits

Secondary Aging
- Disease
- Disability
- Frailty

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Aging at different rates of physiological decline

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Sex (biological) differences in age-associated strength loss across the adult lifespan

- Females experienced accelerated muscle strength declines at a younger age than males
- Faster rate of decline in males than females in lower limb strength
- No difference in upper-limb strength

(Jones et al., in review)

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Years of active life expectancy & projected years of dependent living

Additional Life Expectancy Beyond 65 years

Katz et al. 1983

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Gender differences in age-related loss of strength

Evolutionary perspective
• Men compete for women
• Women chose men

Social construct
• Home vs. work
• ADL preferences

Most likely that sex-differences influence gender choices when it comes to aerobic fitness and muscle strength
Exercise Paradox

Too much

- Increased risk of falls
- Slight risk of medical events
- Non-fall related injuries
- Better chance of survival

Too little

- Much greater increase risk of falls
- Greater risk of medical events
- Much greater risk of injury
- Least chance of survival

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Cardiorespiratory (Aerobic) Fitness

• 3 x 10 min bout of sustained physical activity for the least fit
• 30 min per day, **MINIMUM** for maintaining health
• 60-90 min per day **MAXIMIZE** health and fitness benefits
• Intensity – moderate to vigorous
  • SWEAT!
  • BREATHING HARD!
  • MOVE AT A BRISK PACE!
Muscle Strength/Power Fitness

• 2x per week MINIMUM – included as part of the 150 min accumulated physical activity

• Need to train muscle POWER – “rapid contraction of muscle”

• Progression to POWER training
  1. Muscular endurance (12-15 reps)
     • 4-6 weeks
  2. Muscular strength (6-8 reps)
     • 7-12 weeks
  3. Power (2-3 @ 40-80% max RAPID)
     • 13-16 weeks
Balance/Coordination of movement

- Effective short-term for those with balance deficits
- Choose activities that challenge balance and mobility everyday
- Environment, terrain, crowds
- Mobility/balance paradox
- Improved with lower leg strength/power training

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Flexibility

• Specific exercise required if experiencing a reduced ROM.

• Lack of evidence to support flexibility training

• Movement though ROM during other exercise will promote flexibility
Exercise to reverse frailty in pre-frail women
Currently running CT Reg# H16-00712

- 10 EX and 10 CON matched for age (72-84), all pre-frail
- Experimental measures completed at baseline, week 5, week 9, week 13
- Assessment of strength to apply progressive overload occurs every 3-weeks and at the end of the study to assess absolute change in strength.

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Exercise to reverse frailty in pre-frail women

Aerobic
• 10 min aerobic exercise

Strength
• 3 sets, 6-8 reps, deadlift
• 3 sets, 6-8 reps squat
• 3 sets, 6-8 reps bench press
• 3 sets, 6-8 reps inclined leg press

Balance
• Progression – semi-tandem, tandem, single leg → →

Flexibility
• Hip flexor stretch

8 weeks – in results forthcoming

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The 1-minute workout: How to get fit in 60 seconds

- Yes, effective for both sexes! Even the most unfit and those with failing hearts and metabolic disorders benefit.

<table>
<thead>
<tr>
<th>Time/Duration</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 min</td>
<td>Progressive warm-up to moderate</td>
</tr>
<tr>
<td>20 sec</td>
<td>Very hard (90%+ of max.)</td>
</tr>
<tr>
<td>60 sec</td>
<td>Easy ‘active’ rest</td>
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<td>20 sec</td>
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</tr>
<tr>
<td>120 sec</td>
<td>Active recovery, return to rested state</td>
</tr>
</tbody>
</table>

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High Intensity Interval Training

- Stress ‘eustress’ required for physiological adaptation – push yourself beyond comfort zone (i.e. walk uphill); choose a variety of activities
- To much stress = injury, medical event, overtraining
- To little stress = no health or fitness benefit
- Less duration required if you push yourself harder.
- If unaccustomed to High Intensity exercise consult with your physician first and work with an exercise professional

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Response to aerobic exercise training in the vigorous zone.

- Older men improved aerobic capacity due to improved heart function and increased capillary networks for working tissue.

- Older women may only improve through increased capillary networks, but not necessarily heart function.

Why?

This too is likely both a sex and gender effect. If they exercise hard enough both sexes and genders will experience improvements in heart and vascular performance.
What’s wrong with the picture?
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Are we getting our message across?

“The handle on your recliner does not qualify as an exercise machine.”
Older adults need exercise prehabilitation

• 91% live with one or more chronic diseases
  • Disease prevention – too late?

• 40% live with one or more physical disabilities
  • Active life expectancy – shorter?

• 88% of older men and women **do not meet minimal** physical activity (PA) and exercise recommendations
  • Why are they not listening?

(NACA, 2006)
A Population of Physically Inactive

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(Statistics Canada, 2007)
Yet many older Vernonites are successful at aging

(Paul turns 96, courtesy of Breakaway Fitness)

(Sovereign Lake Nordic Club Master Skiers)

(Kal Running And Triathlon Sports)

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Physical Literacy in Older Adults – An Ecological Model

<table>
<thead>
<tr>
<th>Policy</th>
<th>The model is a <strong>recommended policy element for active and healthy aging initiatives</strong> across pan-governmental and multi-sectoral levels, and non-governmental organizations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community</td>
<td><strong>Context in which physical activity takes place.</strong> Including considerations of how the individual is socially connected, influenced by socio-cultural norms and expectations, and the individual’s interaction with built and natural environments.</td>
</tr>
<tr>
<td>Organizational</td>
<td>Programs, resources and services that <strong>offer personally meaningful, culturally relevant, and accessible opportunities for physical activity.</strong></td>
</tr>
<tr>
<td>Interpersonal</td>
<td>A <strong>spectrum of formal and informal personal relationships</strong> that influence physical activity participation.</td>
</tr>
<tr>
<td>Intrapersonal</td>
<td>The motivation, confidence, physical competence, knowledge and understanding, and <strong>engagement in physical activities</strong> as an integral part of one’s lifestyle.</td>
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Lifecourse Continuum – Cycling in and out
Exercise Training for Life

Skill Tuning (development)

Skill Retuning
Exercise
the New Activity of Daily Living

Think about it...
• Exercise engenders fitness reducing the risk of physical dependence
• Exercise is the best medicine to reduce the impact of chronic disease
• Exercise becomes an essential self-care activity (Activity of Daily Living)
• Arguably, this concept applies across all age-groups
Take home messages

- Sorry no easy fix!
- An effective exercise dose is just the medicine you need to **LIVE BETTER LONGER**
- Your **Olympics is life** and your event is preserving your physical reserve capacity through exercise
- Gold medal performance is retaining your physical independence until the end.

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Thank you for listening

Questions
References


• Bray N.W., Smart R.R., Jakobi J.M., **Jones G.R.** Exercise is Medicine to Reverse Frailty. *Applied Physiology Nutrition and Metabolism* 41(10):1112-1116

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