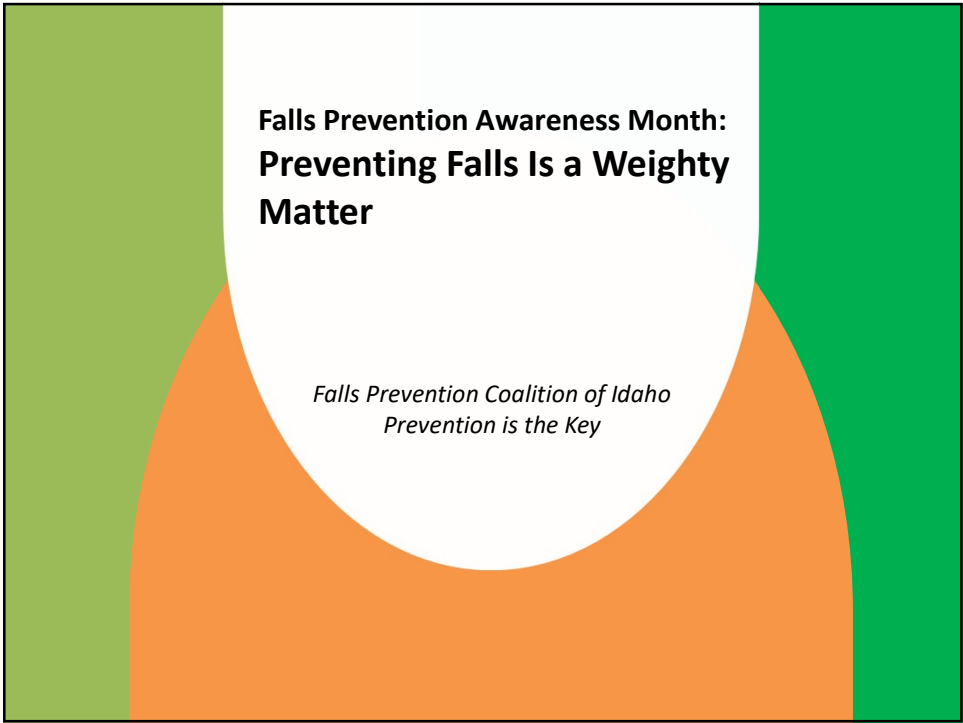




1

Seminar Materials

- Slides available from the Chat pane and on our website
www.aging.idaho.gov/falls
- Recording available on our YouTube Falls Prevention channel
<https://youtube.com/@idahoCOA>

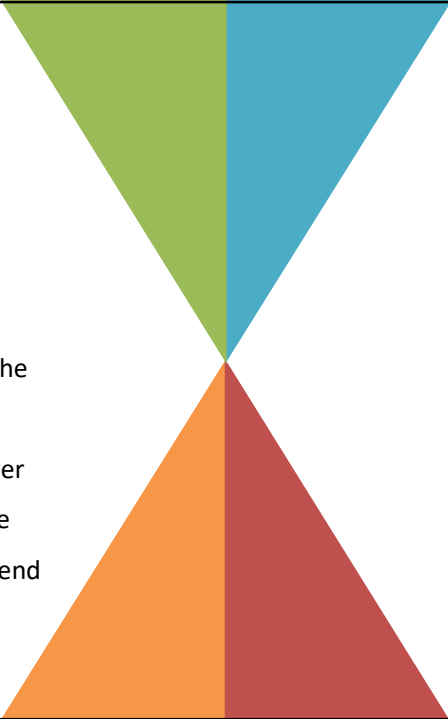


2



Got Questions?

- Feel free to ask questions via the Q&A as you think of them
- Our presenter will either answer them at a good time during the seminar or during Q&A at the end



3

Technical Emergency Plan

- If you have audio or video problems, please close out and log back in
- If we lose our presenter, the technical team will take over until he can log back in



4

What We'll Discuss Today

- Physical activity & overall health
- What happens when you don't move
- More than healthy bones
- Physical activity and chronic disease
- What kind of exercise do we need?
- Q&A

5

WHERE IDAHO FALLS

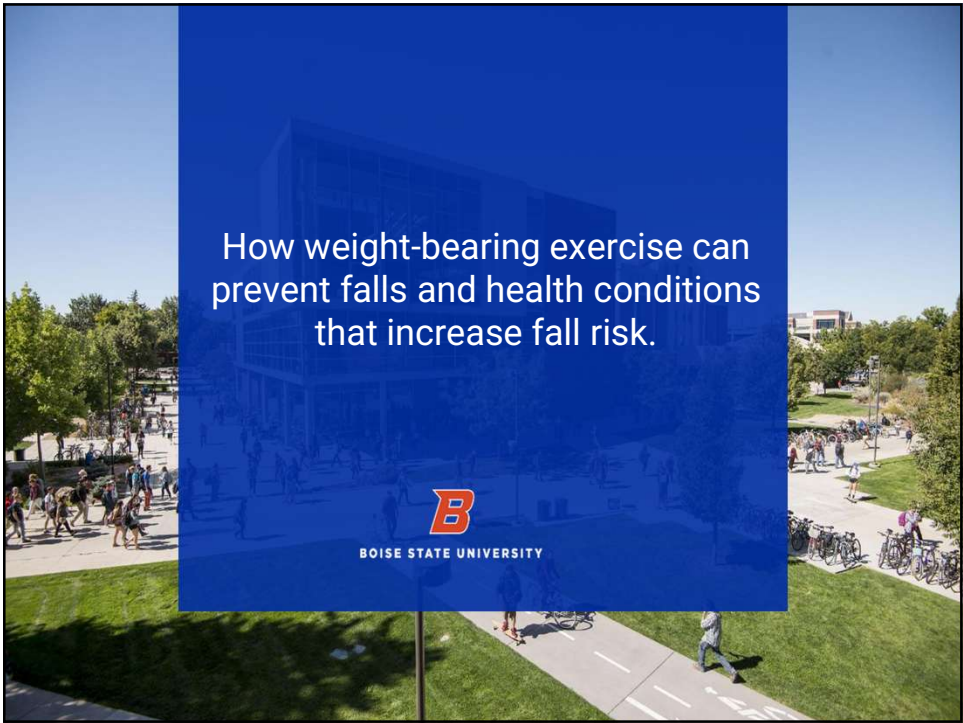
- Idaho in top 10 states for highest number of fatal elderly falls
- More than 75,000 older Idahoans report falling each year
- Over half of falls happen at home, and 23% of Idaho seniors live alone
- Falls are leading cause of injury-related death for older adults, and traumatic brain injuries for all ages
- 1 in 5 falls results in serious injuries, including 95% of hip fractures
- Idahoans pay \$164 million in fall-related medical costs every year
- Risk of physical inactivity increases with age, raising chance of losing muscle strength and balance
- Exercise can restore lost muscle strength and flexibility at any age, vital protection against disease and falls



6



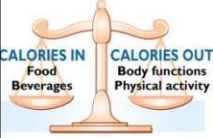
7



8

Hypokinesia (Physical Inactivity) = Pathology

- Hypokinesia
 - Abnormally diminished motor activity. . . a poverty of movement.
 - In conjunction with excess caloric intake (over expenditure)
 - leads to obesity, which can then result in
 - Metabolic syndrome
 - Type 2 diabetes mellitus
 - Cardiovascular disease (CVD)
 - Coronary heart disease
 - Cerebrovascular accident (stroke)
 - Hypertension
 - Cancer
 - Obesity muscular skeletal disorder



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Pathology



9

Chronic Sitting - sitting for long periods of time



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Sitting time may be an independent predictor of negative health outcomes

- Associated with 3 major health concerns
 1. Taking time away from physical activity
 2. Elevates sugar and fat levels in the blood
 3. Triggers inflammation

It isn't the sitting itself, but the lack of being sufficiently physically active

10



Cortisol
 $C_{21}H_{32}O_5$

- In response to psychological stress, sedentary behavior =
 ↑ cortisol reactivity
- Make an effort to take activity breaks when dealing with a stressful situation.
 - Reduces anxiety/stress

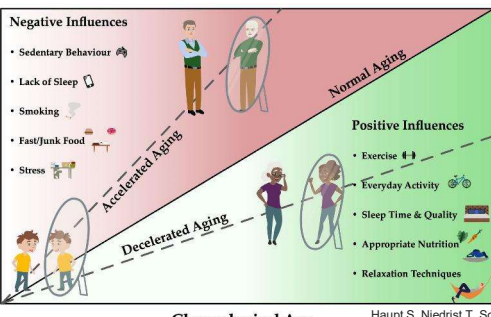
Cortisol and Sitting

AJ Chantry, NC Bishop, M Hamer, AP Kingsnorth, YL Chen, NJ Paine. Sedentary behaviour is associated with heightened cardiovascular, inflammatory and cortisol reactivity to acute psychological stress. *Psychoneuroendocrinology*, 141, 2022, doi.org/10.1016/j.psyneuen.2022.105756.

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11

Aging – acceleration and deceleration



Senescence in the Process of Aging

Normal cell → Senescent cell → Accumulation of senescent cell

Negative Influences:

- Sedentary Behaviour
- Lack of Sleep
- Smoking
- Fast/Junk Food
- Stress

Positive Influences:

- Exercise
- Everyday Activity
- Sleep Time & Quality
- Appropriate Nutrition
- Relaxation Techniques

Senescence factors:

- Mitochondrial dysfunction
- Loss of proteostasis
- Epigenetic alterations
- Telomere attrition
- Genomic instability
- Immunosenescence
- Paracrine senescence

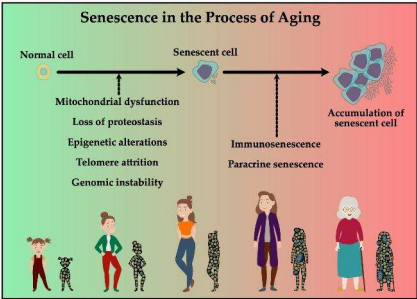
Senescence - condition or process of deterioration with age
Loss of a cell's power for division and growth.

Haupt S, Niedrist T, Sourij H, Schwarzwinger S, Moser O. The Impact of Exercise on Telomere Length, DNA Methylation and Metabolic Footprints. *Cells*. 2022; 11(1):153. <https://doi.org/10.3390/cells11010153>

12

Senescence is driven by

- Oxidation
 - molecule loses electrons,
 - gain of oxygen or loss of hydrogen,.
 - i.e., rusting of iron
 - browning of cut fruit.
- Mitochondrial dysfunction
 - Provide energy molecule (ATP) for all cellular functions
 - Lose efficiency, etc.
 - Cardiovascular disease
 - Muscle loss
- Radiation
 - Energy released from molecules
 - Sun, radon, atmosphere, etc.
 - Damages cells and impairs function
 - Cancer
 - Cataracts

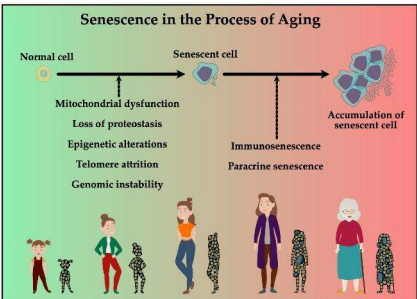


Senescence - condition or process of deterioration with age
Loss of a cell's power for division and growth.

13

Senescence is driven by

- Mutations
 - Changes in genetic code
 - Due to radiation, diet, hypokinesis, pollution, etc.
 - Alters cellular function
 - Cancer
 - Cataracts
- Glycation
 - Sugars attach to proteins and impair function
 - HbA1c
- Inflammation
 - Protective response of the body to activate the immune system and initiate healing/repair
 - Chronic inflammation compromises cell function
 - Cardiovascular disease
 - Stroke

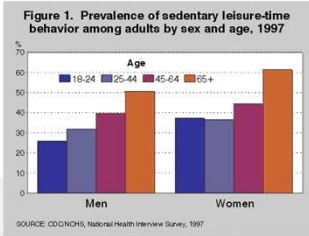


Senescence - condition or process of deterioration with age
Loss of a cell's power for division and growth.

14

With Age:

- Muscular strength decreases (the ability of a muscle or muscle group to exert a maximal force)
 - 65-89 years old, muscle strength has been shown to decline by up 1-2% per year
- Sarcopenia (age-associated loss of skeletal muscle mass due to the reduction in muscle fibers and muscle fiber atrophy)
 - Important factor in age-related strength declines
 - Dependent on a variety of factors:
 - neurological, hormonal, nutritional, and immunological deficiencies
 - Mostly due to older adults being less active



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With Age:

- Muscular strength decreases by up 1-2% per year
- Greater loss of muscular power (the optimal amount of work performed in a given time period)
 - approximately 3-4% per year
 - power is a product of strength and velocity (displacement/time)



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Bone

Atrophy

Osteoporosis

Bone atrophy most often associate with elderly women

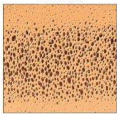
Compromises daily activity

Affects mostly trabecular bone (spongy, porous bone found at the epiphyses and metaphyses of long bones and in vertebral bodies)

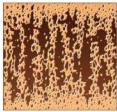
Lose about 0.5 – 1.0 % bone mass/year (♀ after late 20's, & ♂ mid 30's)

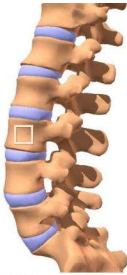
Accelerates to ≈ 6.5% after menopause (rate of loss becomes about the same for both sexes around age 70)

Normal bone

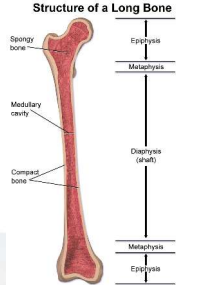


Osteoporotic bone





Structure of a Long Bone



17

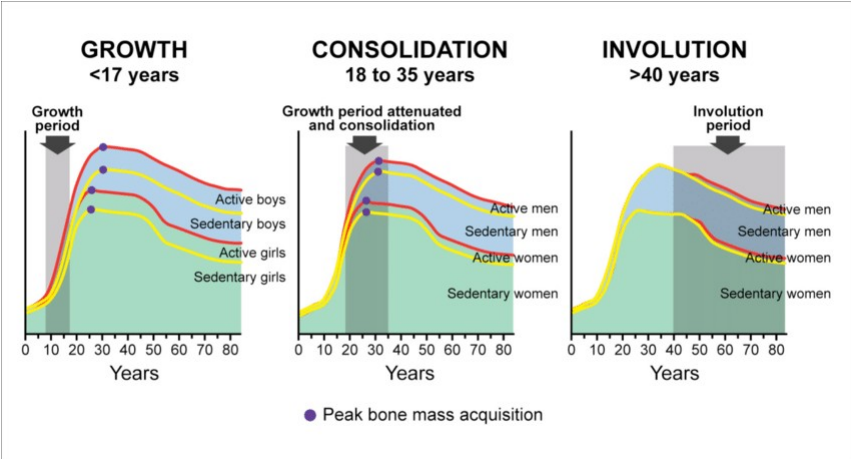
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17

GROWTH

<17 years

Growth period

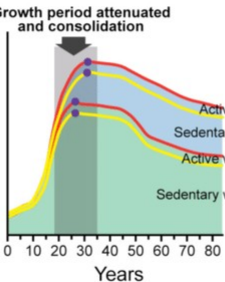


Active boys
Sedentary boys
Active girls
Sedentary girls

CONSOLIDATION

18 to 35 years

Growth period attenuated and consolidation

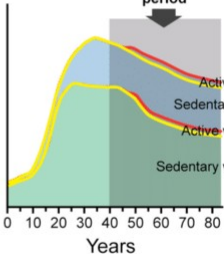


Active men
Sedentary men
Active women
Sedentary women

INVOLUTION

>40 years

Involution period



Active men
Sedentary men
Active women
Sedentary women

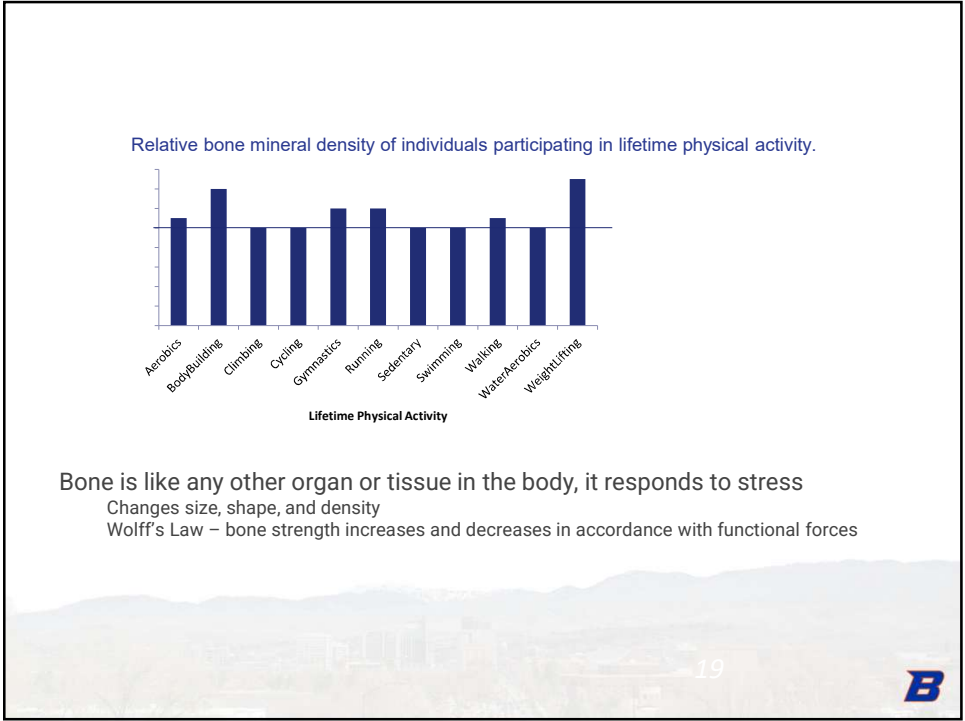
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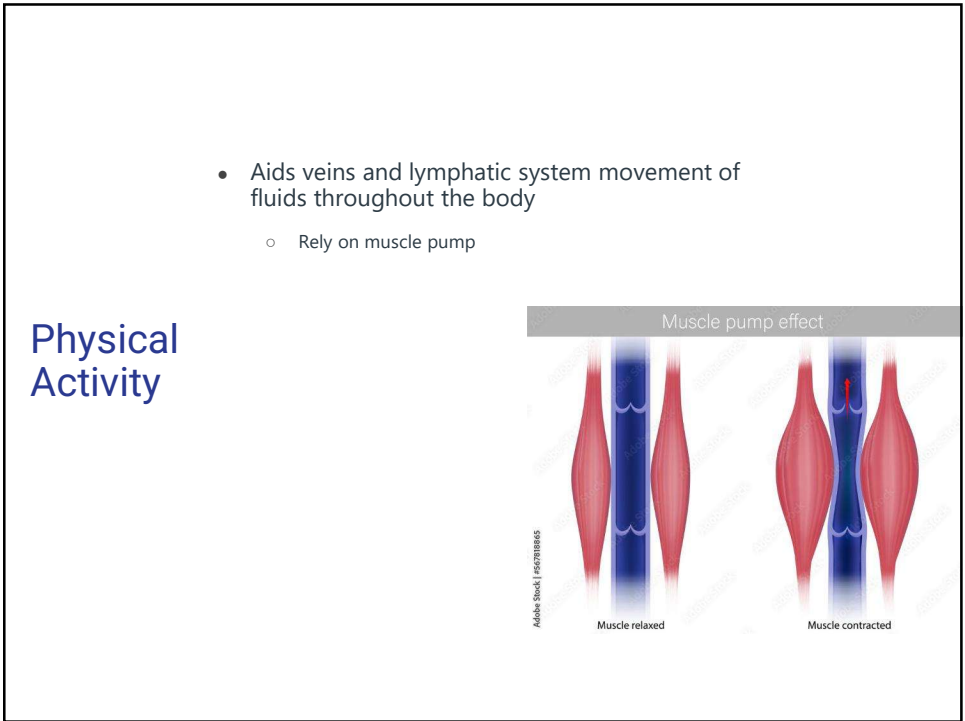
18

Falls Prevention Coalition of Idaho
(aging.idaho.gov/falls)

9



19



20

Physical Activity

- Myokines
 - Inflammatory modulators released during physical activity
 - Physical activity causes muscles to produce a strong, lasting, and widespread anti-inflammatory response.
 - as we age and/or as we experience inflammation, physical activity causes our body to produce a better anti-inflammatory response.

Byunghun So, Hee-Jae Kim, Jinsoo Kim, Wook Song. Exercise-induced myokines in health and metabolic diseases. *Integrative Medicine Research*. 3(4): 172-179. 2014. <https://doi.org/10.1016/j.imr.2014.09.007>.

21

Physical Activity

= Elongation of telomeres

- Telomeres protect DNA

Schellnegger, M., Lin, A.C., Hammer, N. et al. Physical Activity on Telomere Length as a Biomarker for Aging: A Systematic Review. *Sports Med - Open* 8, 111 (2022). <https://doi.org/10.1186/s40798-022-00503-1>

Haupt S, Niedrist T, Sourij H, Schwarzingner S, Moser O. The Impact of Exercise on Telomere Length, DNA Methylation and Metabolic Footprints. *Cells*. 2022; 11(1):153. <https://doi.org/10.3390/cells11010153>

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Acute Exercise

- Improves cognitive ability
- Reduces anxiety
- Increases well-being

Regular Physical Activity

- Control weight
- Reduce cardiovascular diseases
- Delay onset of type 2 diabetes
- Enhance bone and muscle mass
- Prevent falls
- Prolong life



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Physical Activity Helps Prevent Chronic Diseases

- **AEROBIC ACTIVITY**
 - Gets you breathing harder and your heart beating faster
 - Moderate or vigorous intensity, every minute counts
 - At least 150 minutes of moderate-intensity aerobic activity every week
 - Or get at least 75 minutes of vigorous aerobic activity a week
- **MUSCLE STRENGTHENING**
 - Works best when you work all your body's major muscle groups
 - Includes legs, hips, back, chest, abs, shoulders, arms
 - Muscle-strengthening activities at least 2 days a week
- 65 and older - balance-improving activities
- Different types and amounts each week

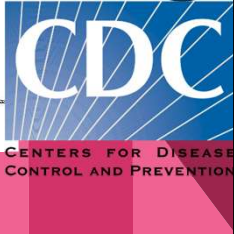


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Physical Activity Helps Prevent Falls and Chronic Diseases

- Talk to your doctor
- Get the support of your friends and family
 - invite them to join you!
- Start slowly and add time, frequency, or intensity every week.
- Schedule physical activity for times in the day or week when you're most energetic.
- Plan to make physical activity part of your daily or weekly schedule.
- Walk or ride instead of drive
- Support neighborhood improvements to make it easier to walk or bike



25

Recommendations for Bone Growth

Osteoporosis

Best countermeasure is lifelong activity and appropriate diet

- Weight bearing activity
- Resistance exercise
- Increased generalized activity
- Increased exercise
- Post-menopausal hormone replacement?
- Calcium supplementation?

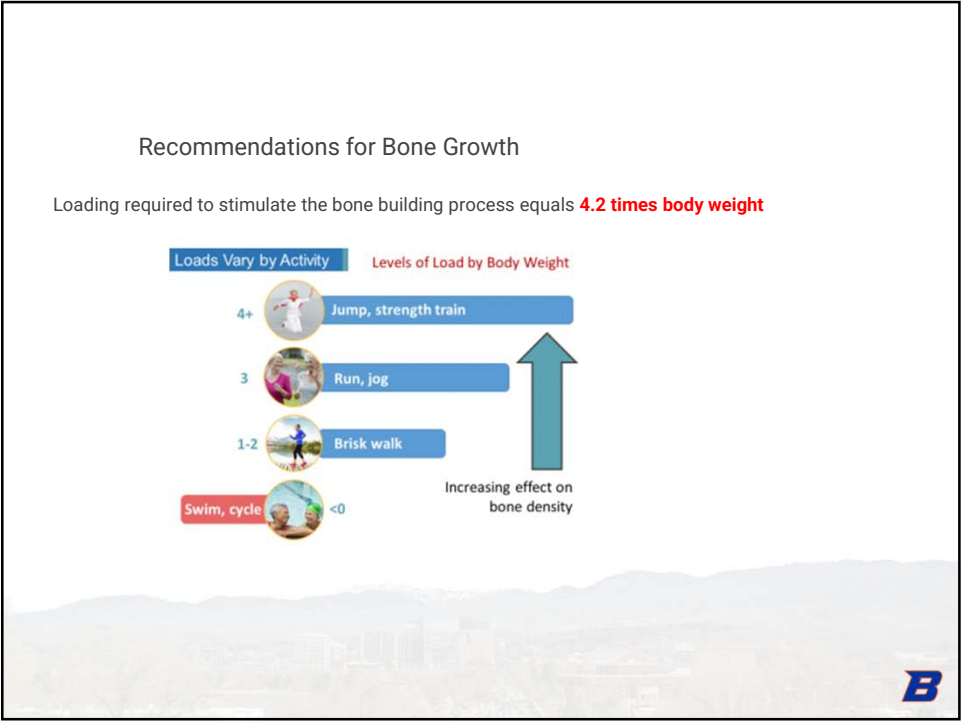


Milk	Yogurt	Soy Beans
Orange	Lady's Finger	Cheese
	Turnip Greens	
Sesame Seeds	Almonds	Cinnamon

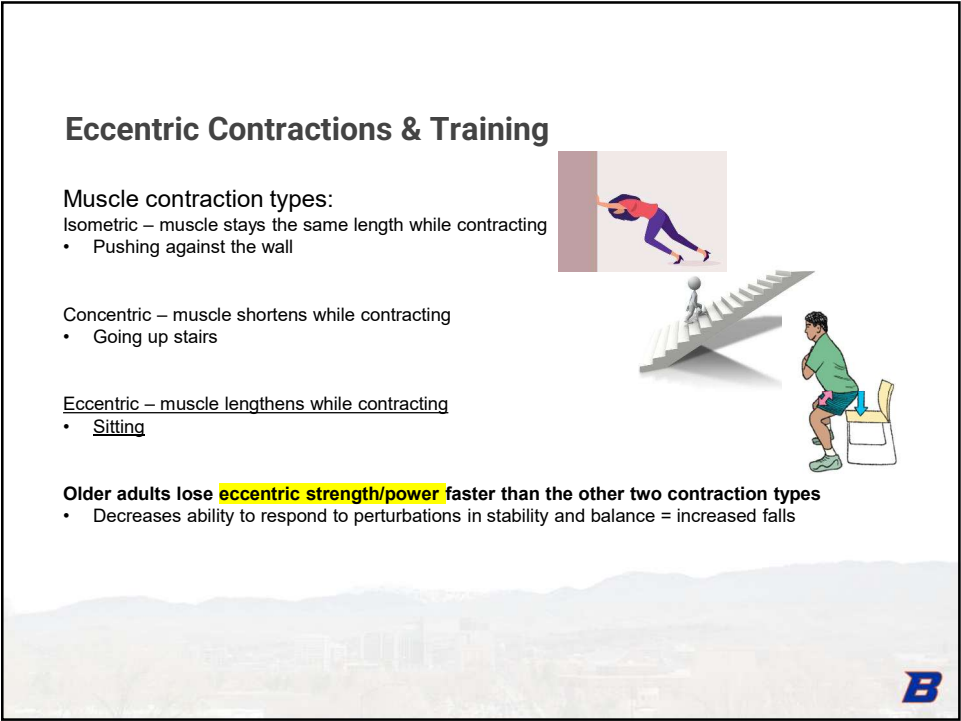
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26



27



28

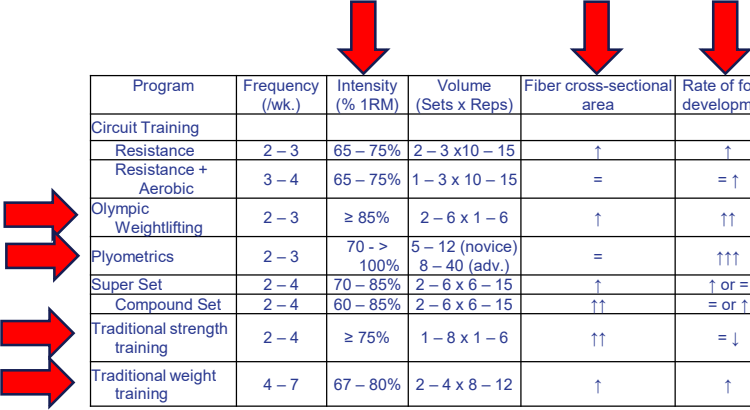
Power Training

Strength Training
Speed Training
Combination Training
Plyometrics





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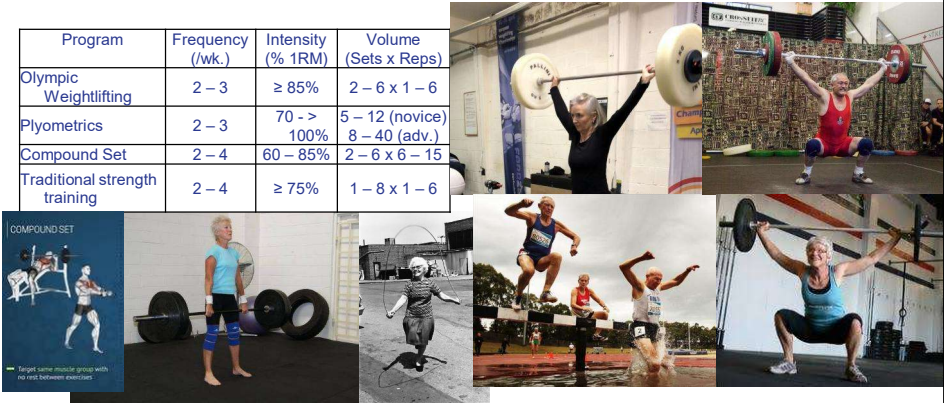
Program	Frequency (/wk.)	Intensity (% 1RM)	Volume (Sets x Reps)	Fiber cross-sectional area	Rate of force development	Economy
Circuit Training						
Resistance	2 – 3	65 – 75%	2 – 3 x 10 – 15	↑	↑	↑
Resistance + Aerobic	3 – 4	65 – 75%	1 – 3 x 10 – 15	=	= ↑	↑
Olympic Weightlifting	2 – 3	≥ 85%	2 – 6 x 1 – 6	↑	↑↑	↑↑
Plyometrics	2 – 3	70 - > 100%	5 – 12 (novice) 8 – 40 (adv.)	=	↑↑↑	↑↑
Super Set	2 – 4	70 – 85%	2 – 6 x 6 – 15	↑	↑ or =	↑
Compound Set	2 – 4	60 – 85%	2 – 6 x 6 – 15	↑↑	= or ↑	↑↑
Traditional strength training	2 – 4	≥ 75%	1 – 8 x 1 – 6	↑↑	= ↓	↑↑
Traditional weight training	4 – 7	67 – 80%	2 – 4 x 8 – 12	↑	↑	↑↑

Recommendations for Strength and Power

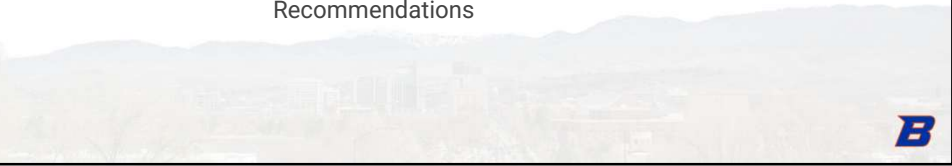


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Program	Frequency (/wk.)	Intensity (% 1RM)	Volume (Sets x Reps)
Olympic Weightlifting	2 – 3	≥ 85%	2 – 6 x 1 – 6
Plyometrics	2 – 3	70 - > 100%	5 – 12 (novice) 8 – 40 (adv.)
Compound Set	2 – 4	60 – 85%	2 – 6 x 6 – 15
Traditional strength training	2 – 4	≥ 75%	1 – 8 x 1 – 6



Recommendations



31

Hypokinesia - When we STOP moving

- Gain weight
- Muscles weaken
- Bone mineral density decreases
- Balance and postural stability decline
- Blood pressure goes up
- Blood sugar regulation is compromised
- Arteries and veins stiffen
- Chromosomes get shorter
- Immune function decreases
- Cell damage increases
- Cognitive function decreases

You Stop You
from Moving
Forward



Adapted from: www.adaptivemovement.com/stop

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I think that I cannot preserve my health and spirits, unless I spend four hours a day at least—and it is commonly more than that—sauntering through the woods and over the hills and fields, absolutely free from all worldly engagements. - Henry David Thoreau

Walking, 1862, p. 6



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The walking of which I speak has nothing in it akin to taking exercise, as it is called, as the sick take medicine at stated hours — as the Swinging of dumb-bells or chairs; but is itself the enterprise and adventure of the day. If you would get exercise, go in search of the springs of life. - Henry David Thoreau

Walking, 1862, p. 10



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What Questions Do You Have?

- Enter questions into the Q&A
- We will pose questions to Dr, Simonson as time allows
- Changes to exercise should be discussed with your healthcare team
- Contact Dr. Simonson:
ShawnSimonson@BoiseState.edu

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Ready to Assist



Your local Area Agency on Aging is ready to assist with services and referrals
<http://aging.idaho.gov/Area-Agencies-On-Aging/>

36

Thank you for Your support

Participants

- We hope you understand how activity can change your overall health, reduce your fall risk, and how you can use exercise to promote it all!

Presenter

- Our expert's insights, knowledge & experience are irreplaceable!

Techie

- We can't do any of it without our behind-the-scenes ZOOMbie!

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We hope you continue to be falls-free in ID!

Best ways to prevent falls:

- Move your body!
- Drink water & eat well
- Get quality sleep & reduce stress
- Find ways to appreciate and enjoy life!

Stay in touch with us: www.aging.idaho.gov/falls

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