Exercise is Medicine: Prescribing Community Based Exercise Programs to Facilitate Physiological Changes in Older Adults

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At the completion of this presentation, attendees will be able to…

1. Describe the role of specificity of training and the overload principle in facilitating physiological changes through exercise in older adults.
2. Define mode, intensity, volume and frequency as components of an exercise program.
3. Discuss national guidelines for exercise in older adults and the expected physiological changes brought on through following these guidelines.
4. Discuss and apply the evidence on physiological changes facilitated through community based exercise programs.
5. Make recommendations to clients on appropriate community based exercise programs based on their goals and current physiological state.

Key Points of the Presentation

1. Exercise must be prescribed correctly. You need to challenge the correct system and overload the system in order to facilitate physiological changes.
2. Physiological changes are not always directly related to changes in function.
3. The best exercise is the one that will be done.

Background Information on Exercise

Overload Principle

In order to stimulate an increase in physiological systems, the stimulus must be greater than what an individual is accustomed to working at.

Specificity of Training

Training should mimic the activity the person hopes to improve.

Adaptation Window

Current abilities will determine how much progress can be made and at what rate. Individuals who are less trained will make larger gains with less stimulus.

Diamond Analogy

Fitness and health are not based on a single physiological factor rather it is an interaction of multiple areas.

Components of an Exercise Prescription

Mode

Type of activities being done

Intensity

How strenuous the activity is, usually measured as a percentage of maximum abilities.

Volume

Number exercises done or amount of time.

Frequency

Number of sessions, usually measured over a week time period.

National Exercise Guidelines for Older Adults[1, 2]

Key Points

1. A physical activity plan based on the client's goal is essential
2. If an individual is not able to meet guidelines, he or she should try to be as active as possible so as to avoid being sedentary.
3. The intensity and duration of physical activity should be low at the outset for those who are highly deconditioned, functionally limited, or have chronic conditions that affect their ability to perform physical tasks.
4. The progression of activities should be individual and tailored to tolerance and preference; a conservative approach may be necessary for the most deconditioned and physically limited older adults.
5. Older adults should exceed the recommended minimum amounts of physical activity if they desire to improve their fitness.
6. Muscle strengthening activities and/or balance training may need to precede aerobic training activities among very frail individuals.

Resistance Training

Mode

Progressive weight training program or weight bearing calisthenics (8–10 exercises involving the major muscle groups of 8–12 repetitions each), stair climbing, and other strengthening activities that use the major muscle groups.

Intensity

Between moderate (5-6) and vigorous (7-8) intensity on a scale of 0-10. A resistance should be used that allows 8-12 repetitions.

Volume

Complete 1-3 sets of each exercise, 10-15 repetitions or 8-12 repetitions per set. NOTE: If the individual can perform more than 20 or more repetitions with prescribed resistance, need to increase intensity.

Frequency
At least two days a week

Balance Training
Those who are frequent fallers or individuals with mobility problems should take part in balance training exercise programs. There are currently no specific recommendations regarding specific frequency, intensity, or type of balance exercises for older adults, but the ACSM recommends using activities that include the following:

- Progressively difficult postures that gradually reduce the base of support (e.g., two-legged stand, semitandem stand, tandem stand, one-legged stand)
- Dynamic movements that perturb the center of gravity (e.g., tandem walk, circle turns)
- Stressing postural muscle groups (e.g., heel stands, toe stands)
- Reducing sensory input (e.g., standing with eyes closed).

Aerobic Training
Mode
Any modality that does not impose excessive orthopedic stress; walking is the most common type of activity. Aquatic exercise and stationary cycle exercise may be advantageous for those with limited tolerance for weight bearing activity.

Intensity
On a scale of 0 to 10 for level of physical exertion, 5 to 6 for moderate-intensity and 7 to 8 for vigorous intensity.

Volume/Frequency
For moderate intensity, accumulate at least 30-60 minutes a day to total 150-300 minutes a week. For vigorous activity, 75-150 minutes a week is equivalent. Exercises can be done in 10 minute segments.

Flexibility Training
Mode
Any activities that maintain or increase flexibility using sustained stretches for each major muscle group and static rather than ballistic movements.

Intensity
Moderate intensity (5-6) on a scale of 0-10.

Frequency
Two days a week. Best done after aerobic training

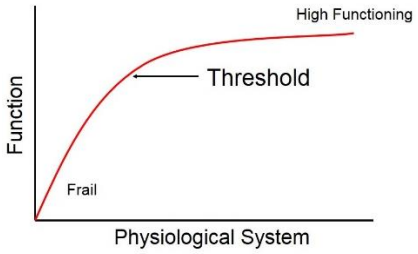
American Academy of Family Physicians – Recommendations on Exercise Prescription for Older Adults [3]

Clinical Recommendation	Evidence Rating
For older adults, any physical activity is better than being sedentary. Reducing sedentary time has cardiovascular, metabolic, & functional benefits.	B
Resistance training preserves muscle strength and physical functioning in older adults.	A
To promote and maintain health, older adults should aim for at least 150 minutes of moderate-intensity aerobic activity and two or more days of resistance training per week.	B
Flexibility exercises improve & maintain joint range of movement in older adults.	C
Balance exercises (e.g. tai chi, yoga) can improve or maintain physical function and reduce falls in older adults at risk of falling.	A
Physical activity decreases the risk of chronic disease and enchases treatment.	B

A = consistent, good-quality patient-oriented evidence B = inconsistent or limited-quality patient oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion or case series

Expected Physiological Changes with Exercise[4-6]

Aging negatively impacts every system in our bodies. Exercise can help slow these changes. The relationship between physiological changes and function are not always linear. For each activity, there is a threshold of performance in the physiological system needed to do the activity. For example, so much strength is needed to stand up from a chair. When the individual has enough ability in the physiological system to do the activity, further improvements will not change the activity. However it will provide a physiological reserve to help preserve function if deconditioning takes place in the future. When the individual is below the threshold, a physiological change will lead to an improvement in function.



Below is a list of the physiological changes that take place with each form of exercise. This assumes multiple months of training and the exercise being prescribed is at the correct dosage.

Aerobic Training

- Improved aerobic capacity
- Lower heart rate
- Lower blood pressure
- Improved oxygen extraction by muscles
- Reduction in fat mass (but not fat free mass)
- Higher intensity and higher impact can help maintain/improve bone mineral density

Resistance Training

- Improved strength
- Improved power
- Better nervous system coordination of muscle contraction
- Hypertrophy (but to a lower amount than younger adults)
- Higher intensity can lead to increases in fat free mass
- Preservation and improvement in body mineral density

Balance Training

- Improved reaction times
- Improved static and dynamic balance

Flexibility

- Improved range of motion in some studies
- Little evidence on the physiological benefits of flexibility training

Review of Community Based Exercise Programs and Physiological Changes

Most studies on community based programs focus on falls, confidence, and measures of balance as primary outcomes, not physiological measures such as aerobic capacity or strength. The exercises used within these programs are standardized and have been shown to have physiological benefits.

Matter of Balance

The program focuses more strategies to reduce fear of falling and increase activity levels. Includes exercises to increase strength and balance with a mix of sitting and standing exercises, typically no resistance besides body weight.

Outcomes

- Increase in activity, mobility, and social function.[7]
- Decrease fall risk and improvement on physical performance tests.[8]
- Shown to improve fall efficacy in those 85 years of age and older.[9]

Stepping On

Program focuses on improving fall self-efficacy, behavioral change and reduction in falls through coping strategies, safety, and awareness. Includes a lower limb balance and strength program. Exercises similar to Matter of Balance exercises with a mix of sitting, standing, and balance exercises. Use of body weight as resistance

Outcomes

- 31% reduction in falls for those who completed the program. [10]

Tai Chi Programs

Range of different programs and variations of Tai Chi. Some programs include YMCA Moving for Better Balance, Tai Chi for Arthritis, and Tai Ji Quan Moving for Better Balance. All include a variation of traditional Tai Chi that have been modified for older adults of differing abilities. The modifications also allow less training for the instructors.

Outcomes

- Better balance, perceived physical health and self efficacy.[11]
- Lower fall rates and lower risk of falls[12]
- Improvements in balance[12, 13]

EnhanceFitness

Exercise program that focuses on dynamic cardiovascular exercise, strength training, balance, and flexibility. Uses certified fitness trainers. Will use ankle weights and hand weights during training.

Outcomes

- Reduced risk of falls resulting in medical care.[14]

Silver Sneakers

Community fitness classes encouraging older adults to participate in physical activities that will help them to maintain greater control of their health. It sponsors activities and social events designed to keep seniors healthy while encouraging social interaction.

Outcomes

- Reduced risk of falls.[14]
- Lower healthcare costs after two years in the program.[15]

Choosing a Program to Facilitate Physiological Changes

1. What are the client's goals
2. What are the client's needs
3. Does the client need education along with their exercise program?
4. Based on medical condition, does the client qualify for other interventions (cardiac or pulmonary rehabilitation)?
5. Would they be more appropriate for physical therapy or other rehabilitation services first?
6. Is this his or her first exercise program?
7. Where are they at in their adaptation window?

Key Points of the Presentation

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References

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