Exercise in the Aging Adult

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Aging and Demographics

- Older adults are the fastest growing segment of the population

![Chart showing the percentage of women and men aged 65 and older from 1940 to 2040.](U.S. Bureau of the Census, 2000)
PHYSICAL ACTIVITY & OLDER AMERICANS

Physical activity is an essential component to a healthy lifestyle. Nowhere is this fact truer, than in the case of individuals over the age of 65. Older Americans are at higher risk for many health problems that being active can help prevent. Regular physical activity has been linked to a lower risk of coronary heart disease, colon cancer, diabetes, arthritis, high blood pressure, and obesity. Despite these obvious health benefits, current numbers suggest older Americans aren’t getting enough.

POPULATION OF AGE 65 OR OLDER

The elderly population has exploded in recent years due to the baby boomer generation reaching retirement age at the beginning of this century.

IN 1900
3.1 MILLION PERSONS
TOTAL PER 100 POPULATION

BY 2030
IT IS EXPECTED THAT THIS POPULATION WILL GROW TO
72 MILLION PERSONS
(20% OF US POPULATION)

OF 39 MILLION PERSONS
AGE 65 OR OLDER, ONLY
22%
REPORT ENGAGING IN REGULAR PHYSICAL ACTIVITY.

AVERAGE TIME SPENT ENGAGING IN PHYSICAL ACTIVITY
.29 HOURS
17 MINUTES

AVERAGE TIME SPENT WATCHING TV
4.3 HOURS
Inactivity = Loss of Independence

- The loss of physical function is exponential and will eventually cross a threshold level beyond which a person cannot maintain an independent life.
- Rising from a chair is difficult, and getting up off the floor without help is impossible.
- Crossing a road within the time allowed on traffic light controlled crossings requires an average walking speed that is higher than that achievable by most 70 year olds.
- Among people older than 65, 12% cannot manage walking outside on their own and 9% cannot manage stairs unaided.
- In the over-70s, 25% of women and 7% of men do not have sufficient leg strength to get out of a chair without using their arms.
- Twenty per cent of women and 14% of men over 50 do not have the flexibility to wash their hair comfortably.
- Forty-seven per cent of women aged 70–74 have insufficient leg muscle power to step up onto a bus without using their arms.
The new wonder drug
A DRUG CALLED EXERCISE

*Generic name: physical activity
*Brand names: running, walking, swimming, dancing, soccer, gardening........
*Dosage: optimum 150 minutes/week but effective in smaller doses
*Use in Pregnancy and lactation: beneficial and safe for Mother and baby
Exercise as a drug

*Indications and Usage

# prevent and reverse obesity
# improve muscle strength and reduce atrophy
# reduce development and improve management of diabetes
# prevent and treat heart disease
# lower risk of cancer (breast and colon)
# treatment of HTN
# prevent osteoporosis and fractures
# improve balance and reduce risk of falls and serious injury
# manage depression and anxiety
# reduce risk of dementia and improve cognition
# recreational uses and improve social interaction
# decrease risk of premature death
Exercise as a drug

- Side effects: decreased BP, Heart Rate and BS, stronger mm and bones, weight loss, improved mood and confidence, self esteem and concentration; Improved bowel function, sleep.
- Adverse reactions: diaphoresis, injury, sudden death (rare).
- Administration: self administer alone or with others. Begin slowly and titrate as tolerated.
- $$$Cost: FREE
Exercise is a Wonder Drug

- If there were a drug or pill that offered the proven health benefits of exercise, prevent and treat chronic disease and increase life span with the side effect profile illustrated, physicians would prescribe it to every patient and healthcare systems and insurers would find a way to give pts access to it.
EXERCISE!!!!

• SUBSTANTIAL HEALTH BENEFITS
• 150-300 MINUTES/WEEK (2.5-5HRS) OF MODERATE INTENSITY activity
• 75 MIN/WEEK (1.25 HRS) of VIGOROUS INTENSITY activity
• HIIT (High Intensity Interval Training): exercise 30-60 sec near peak, rest and repeat for 20 minutes 3 x week…bike, treadmill, burpees, jumping jacks, swimming, weights
“What fits your busy schedule better, exercising one hour a day or being dead 24 hours a day?”
Aging considerations

• Bad and good news
Aging
THE GOOD THE BAD AND THE UGLY

• Bad News
  – Capacity declines as you age

• Good News
  – You can do something about it
  – Fatigue and immobility are not inevitable with aging
  – Fitness is not that hard to achieve
The Bad News About Aerobic Exercise and Aging

• Bad News 1: Muscle function does change with age
  – Strength decreases due to loss of muscle mass.
  – Fiber type switching to type II x (less efficient)
  – Increased fibrous tissue in muscle
Sarcopenia

• Sarcopenia- the age-associated loss of skeletal muscle mass and function.

» Rosenberg, 1989
Sarcopenia

- “Sarcopenia is the age-associated loss of skeletal muscle mass and function. Sarcopenia is a complex syndrome that is associated with muscle mass loss alone or in conjunction with increased fat mass. The causes of sarcopenia are multi-factorial and can include disuse, changing endocrine function, chronic diseases, inflammation, insulin resistance, and nutritional deficiencies. While cachexia may be a component of sarcopenia, the two conditions are not the same.” --- A group of geriatricians and scientists from academia and industry met in Rome, Italy on November 18, 2009 to arrive at a consensus definition of sarcopenia.
The presence of sarcopenia and the relationship between sarcopenia and functional impairment and disability were examined in 4,504 adults aged 60 and older.

Skeletal muscle mass was estimated from bioimpedance analysis measurements and expressed as skeletal muscle mass index (SMI = skeletal muscle mass/body mass × 100). Subjects were considered to have a normal SMI if their SMI was greater than one standard deviation above the sex-specific mean for young adults (aged 18–39).

Class I sarcopenia was considered present in subjects whose SMI was within one to two standard deviations of young adult values, and class II sarcopenia was present in subjects whose SMI was below two standard deviations of young adult values.

The measurement of fat free mass in humans is difficult. The most direct measurement currently available is urinary creatinine measured over 24-hour periods. But there are other indirect measures often used which include bioelectrical impedance, and imaging techniques like CT or MRI, ultrasound.

Recent studies have demonstrated that not only is muscle mass reduced with advancing age, but the quality of muscle may also change. Increased skeletal muscle lipid, assessed by computerized tomography, is increased with advancing age and increased total body fatness.
Epidemiology

Strength

• Greater decline in strength than muscle mass
• Muscle quality plays a role in the loss of strength in old age
  • Declines 15% in 6th and 7th decades and 30% after the 7th decade
  • Greater decline in lower body vs. upper body strength
  • Greater decline in extensors vs. flexors
  • Power (force x velocity) declines more than strength and muscle mass

  – Weakness is a more powerful predictor of morbidity/mortality in the elderly than muscle mass

# Framingham Study

% of women that can not lift 10 lbs

<table>
<thead>
<tr>
<th>% of women that can not lift 10 lbs</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>55-64</td>
</tr>
<tr>
<td>45%</td>
<td>65-74</td>
</tr>
<tr>
<td>65%</td>
<td>75-85</td>
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</tbody>
</table>

Bad News 2: Cardiovascular function does change with age

- Maximum heart rate decreases with age (MHR = 220 – age)
- Resting cardiac output declines about 1%/year during adulthood
- Coronary artery disease is more common
- Blood flow during exercise is less
- Maximum exercise declines gradually with age
Bad News 3: Pulmonary Function Changes with Age

- Lung capacity declines
- Chest wall is stiffer (less compliance)
- Decreased oxygen absorption/ diffusion capacity (lower DLco)
- Breathing becomes less efficient with age
- Loss of lung volume with aging (1% per year)
Limits on $O_2$ Consumption

• Stroke Volume
  – End Systolic Volume
  – End Diastolic Volume

Reduced in Cardiac Disease
Myocardial Infarction
Heart Failure

• Muscle mass decreased
• Neurologic dysfunction
Relationship of Dynamic Exercise and Oxygen Uptake

Heart Disease
Bad News 4: Aging Alters Body Composition

Body Composition

• Increased Fatty Tissue
• Decreased Lean Mass

Stature

• We grow shorter as we get older by about one-half inch per decade after age 30.
Age-Related Changes in Body Composition

- ↓ lean body mass
- ↑ % body fat
- ↑ weight
- ↓ height
Bad News 5. Multiple factors may explain the changes in functional capacities with age

- True aging phenomena
- Unrecognized disease processes
- Disuse phenomena
- Deconditioning
- Medications
Good News 1: There are Benefits to Aerobic Exercise

- Improved sense of well-being
- Weight control
- Decreased fatigue
- Improved immunity
- Decreased bone/lean body mass loss
- Decreased cardiac disease
- Decreased decline in function
Good News 2: These benefits of exercise come about in many ways

- Improved efficiency
  - Increased cardiac function
  - Improved circulation
  - Improved muscle function
  - Improved neural control of function
  - Increased lean body mass
  - Improved basal metabolic function
Good News 3: Improved Heart Function

- Improved cardiac output
  - Increased stroke volume
- Decreased resting heart rate
  - Decreased anginal symptoms
  - Decreased work of the heart
- Decreased systemic blood pressure
  - Less resistance for cardiac work
Good News 4: Improved Circulation

• Decreased arterial resistance
• Decreased blood pressure
• Improved capillary function
  – Decreased diastolic blood pressure
  – Improved delivery of oxygen to the peripheral tissues
• Improved muscle tone in the blood vessel walls
Good News 5: Improved Muscle Function

- Improved muscular circulation
- Improved capacity to aerobically metabolize and perform work
- Increased mitochondria (muscle power generation)
- Increased muscle fiber density
Good News 6: Increased Lean Body Mass

- Increase in muscle tissue
- Decrease in fatty tissue
- Improved metabolism
  - Increase use of fat
  - Decreased storage of fat
- Helps with weight maintenance
- Decreased appetite
  - Moderate exercise decreases appetite
Exercise in Osteoarthritis

• Combination of:
  – Strength training (ST)
  – Active range of motion exercise
  – Aerobic activity

• Strength training:
  – Resistance-based lower limb, hip and quadriceps strengthening exercises

• Water-based exercise in knee and hip OA found benefits for function and quality of life

• Reductions in pain and disability for overweight patients with OA were found with weight loss (5% in 20 wks)
Exercise in Osteoarthritis

Exercise in Osteoarthritis

Osteopenia/porosis

- Decrease in bone density
- Most common type of bone disease
- 50% of women over age 50
- 20-30% of men
- **Symptoms:** loss of height, kyphosis, low-trauma fracture

Osteoporosis and Fracture Risk

[Graph showing fracture risk percentage per year for different ages (-3, -2.5, -2, -1.5, -1, -0.5, 0, 0.5, 1). The graph indicates a decrease in fracture risk with increasing age.]
Managing Osteoporosis

• Julius Wolff (1891) – Bone, in a healthy subject, will adapt to the loads under which it is placed
• Exercise → Bone remodeling
• Primary goal is reducing fracture risk
  – Slow/stop bone loss
  – Increase bone mass/improve bone architecture
  – Maintain/increase bone strength
  – Minimize risk of falls
  – But also important is improved balance and muscle strength which < falls
Exercise Recommendations: Osteoporosis

- Exercises can increase bone mass if they increase muscle mass and strength.
- Muscles to target to help with posture and prevent falls:
  - Back extensors
  - Lower extremity muscle groups – such as the knee and hip extensors, hip flexors, dorsiflexors and plantarflexors
- Compound movements can be effective way to target all these areas.

Exercise in Osteoporosis

• Focus on improving agility, balance and posture
  – Avoid high impact activities
  – Avoid activities with a risk of fall
  – Avoid repeated/resisted trunk flexion movements
  – Weight bearing ex is best

• Moderate intensity physical activity can help improve balance and agility, thereby minimizing falls
  – Among women 75 or older, exercise has been shown to reduce risk of fall and injury by 75%

Principles of aerobic training for a healthy older adult

- **Mode:**
  - Aerobic activity
- **Intensity:**
  - An intensity of 55 to 90 percent of maximal heart rate or 40 to 85 percent of maximum heart rate reserve
- **Duration:**
  - A duration of 20 to 60 minutes a session (or in 10-minute bouts accumulated throughout the day)
- **Frequency:**
  - A frequency of three to five days per week
SURPRISE! Aerobic Exercise is Reasonably Easy to Do

• Even Moderate daily activities are helpful
  – Brisk walking
  – Gardening
  – Yard work
  – Housework
  – Climbing stairs
  – Active recreational pursuits
Where to start

• For a sedentary person, walking is feasible

• To start resistance training:
  – Perform 8-10 repetitions of 8-10 exercises for major muscle groups
  – Start with 40% of one repetition maximum and increase slowly

• Resistance training initially requires professional instruction/machines

Sweaty Answer for Chronic Ills

Studies suggest that intense exercise can blunt the symptoms of some ailments.

Many people with chronic health problems resign themselves to lives of modest activity or no activity at all, thinking vigorous exercise is unsafe or that they lack the stamina for it. But recent studies are proving just the opposite. They are showing that high-intensity exercise may be even better than regular aerobic activities for many patients with conditions like heart disease, diabetes, stroke, pulmonary disease, arthritis and Parkinson’s disease.

The studies strongly suggest that a more demanding but more efficient and often more enjoyable form of exercise known as high-intensity interval training, or HIIT, is not only safe for most patients but more effective at preventing or reversing the deficits associated with many chronic ailments.

Although once reserved for athletes seeking a competitive advantage and for healthy people wanting to burn more body fat, HIIT is now being studied as a treatment that is sometimes as effective as medication for many people with chronic problems like walking and jogging, especially on a treadmill, which is more elastic than continuous modest exercise.
Exercise prescription
Caution 1: Recommendations for Developing and Maintaining Fitness

- Use large muscle groups
- Continuous, rhythmical, aerobic activities
- Use heart rate guidelines
- Use Warm-up and Cool-down
- Assess cardiac risk
  - Simple history => family history
  - Unexplained dyspnea
- Orthopedic risks
Endurance Training Recommendations

Rx

- Type
- Intensity- Moderate (RPE)
- Duration- ≥30 min/day
- Frequency- ≥ 5 days/week (total ≥ 150 min/wk)

» Or

- Intensity- Vigorous
- Duration- ≥ 20 min/day
- Frequency- ≥ 3 days/week (total ≥ 75 min/wk)
### Table 3. Resistance training program recommendations

<table>
<thead>
<tr>
<th>Category</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercises</td>
<td>8–10 that target the major muscle groups</td>
</tr>
<tr>
<td>Repetitions</td>
<td>8–12 per set. When able to achieve 12 repetitions, increase resistance so that 8 repetitions are possible</td>
</tr>
<tr>
<td>Sets</td>
<td>Minimum of 1, preferably 2–3 per exercise with 1–2 minutes rest between sets</td>
</tr>
<tr>
<td>Frequency</td>
<td>1–3 days per week with at least 48 hours between sessions</td>
</tr>
<tr>
<td>Velocity</td>
<td>2–3 seconds concentric and 2–3 seconds eccentric. Some sets of rapid concentric movements can also be included</td>
</tr>
<tr>
<td>Breathing</td>
<td>Normal breathing on each repetition (no breath holding)</td>
</tr>
<tr>
<td>Duration</td>
<td>Less than 1 hour</td>
</tr>
</tbody>
</table>
Strength Training Recommendations

- Frequency: 2-4 days per week, with 48hrs between training sessions
- Duration: 20-45 minutes
- Type: multi joint preferred, machine vs free weight
- Intensity: up to 65-85% of 1 RM
- Repetitions: 10-15
- Monthly adjustments- overload principle
Remember Basic Physiology!

- **Endurance activity requires more aerobic fibers**
  - This is predominantly Type 1 fibers
    - Sustain activity for hours, but slow twitch speed and small fiber size
- **Short burst activity requires more anaerobic fibers**
  - These are predominantly Type 2 fibers subdivided into:
    - 2a moderately fast – long term anaerobic (<30 min)
    - 2x fast – intermediate short term aerobic (<5 min)
    - 2b very fast – short term aerobic (<1 min)
Endurance Tips

Don’t ask patients to check their pulse unless post MI or new dx CHF → cardiac rehab
Are you exercising? = yes, if breathing increases
Can you talk & sing? = moderate
Can you talk? = vigorous

Slow down if you cannot talk or feel out of breath

Max HR=220 – age
The PowerEx program at Sheltering Arms is designed for individuals who are king to develop a healthier lifestyle through exercise. Whether you have a medical condition that requires special consideration, or would just like some help getting started, our Fitness Specialists have the expertise you need.

Through PowerEx, a Fitness Specialist will conduct health and fitness assessments, design individualized exercise programs to meet your specific needs, and provide regular progress updates to you physician.

Offering personalized attention in an intimate setting, you can feel comfortable starting and maintaining an exercise plan at Sheltering Arms no matter what your current fitness level.

What does the program include?
Medical background & fitness assessment
  • Health/medical history
  • Risk level determination
  • Resting measurements (heart rate and blood pressure)
  • Further assessments and testing based on individual findings and needs
  • Individualized exercise program for gym, home, or both
•6 individual half-hour sessions with a personal trainer
•3-month membership to the Sheltering Arms Fitness Centers & Pool
•3 group nutrition lectures

The cost for this 3-month comprehensive program is $120. Once you have received a referral from your physician, it is as simple as calling (804) 764-5275 and scheduling your first visit!
Conclusion

• Moderate aerobic exercise is very beneficial and **safe** in most individuals
• Even *(especially)* individuals with cardiac, pulmonary, or peripheral vascular disease will benefit.
• After the age of 40, consider if there are risks prior to high intensity exercise, moderate is always safe
• Qualified supervision in disease states
  – May benefit from specific programs
Thank You