Balance and Power Training for Mature Adults

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Miracles Fitness
Huge Growth means Huge Potential...

Total number of persons age 65 or older, by age group, 1900 to 2050, in millions

Note: Data for the years 2000 to 2050 are middle-series projections of the population.
Reference population: These data refer to the resident population.
Source: U.S. Census Bureau, Decennial Census Data and Population Projections.
Percentage of persons age 70 or older who are unable to perform certain physical functions, by sex, 1984 and 1995

Note: The nine physical functioning activities are: walking a quarter mile; walking up ten steps without resting; standing or being on your feet for about two hours; sitting for about two hours; stooping, crouching or kneeling; reaching up over your head; reaching out as if to shake someone’s hand; using your fingers to grasp or handle; lifting or carrying something as heavy as ten pounds. A person is considered disabled if he or she is unable to perform an activity alone and without aids. Rates for 1984 are age-adjusted to the 1995 population.
Reference population: These data refer to the civilian noninstitutional population.
Source: Supplement on Aging and Second Supplement on Aging.
Percentage of persons age 70 or older who reported having selected chronic conditions, by sex, 1984 and 1995

Men

<table>
<thead>
<tr>
<th>Condition</th>
<th>1984</th>
<th>1995</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>45%</td>
<td>50%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>10%</td>
<td>13%</td>
</tr>
<tr>
<td>Cancer</td>
<td>14%</td>
<td>23%</td>
</tr>
<tr>
<td>Stroke</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>37%</td>
<td>41%</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>25%</td>
<td>19%</td>
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</tbody>
</table>

Women

<table>
<thead>
<tr>
<th>Condition</th>
<th>1984</th>
<th>1995</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>61%</td>
<td>64%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>10%</td>
<td>12%</td>
</tr>
<tr>
<td>Cancer</td>
<td>12%</td>
<td>17%</td>
</tr>
<tr>
<td>Stroke</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>51%</td>
<td>48%</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>15%</td>
<td>19%</td>
</tr>
</tbody>
</table>

Note: 1984 percentages are age-adjusted to the 1995 population.
Reference population: These data refer to the civilian noninstitutional population.
Source: Supplement on Aging and Second Supplement on Aging.
The Research Says...

Have we oversold the benefits of late-life exercise? (2001)

Critical review of 31 studies
- Impairment – Strength, ROM, Aerobic capacity, body comp
- Function – Walking, chair rise, balance
- Disability – Physical, social, emotional, overall


Pooled data from 62 trials
- Randomized controlled trials
- PRT with subjects aged 60+

Results
- Large positive effect on muscular strength
- Small to moderate effect on functional ability
  - Strength gains do not equate to similar functional gains
- No evidence of an effect was found for physical disability
Key Points:

• There is consistent and convincing evidence that older adults and adults with knee OA who engage in strength training or aerobic exercise are able to decrease pain and increase strength and physical function.

• The effects on strength, pain and function, though, are modest, at best.

• It is not clear that exercise interventions alone will minimize or prevent disability.

• Exercise may be necessary but not sufficient in minimizing or preventing disability. Effective interventions for minimizing disability are scarce and novel approaches are needed.
How do we maximize function and prevent disability in aging adults if basic cardio and strength training aren’t enough?

Take a comprehensive approach to training the components of function (i.e. impairment level factors).
What leads to functional loss and disability?

The Nagi Model
Revised, Rikli and Jones, 1997

Disease/Pathology  
Lifestyle/Inactivity  
Impairment  
Functional Limitation  
Disability
What is the trajectory of aging? How do we delay or prevent the slide towards disability? Is the aging process inevitable?
Muscle Power and Aging
What is Power?

- Power (W) = Force (N) x Velocity (m/s)
- Rate at which work is performed

<table>
<thead>
<tr>
<th>Power Comparisons</th>
<th>Force</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shot (7.25 Kg 18.19 m)</td>
<td>513 N</td>
<td>5075 W</td>
</tr>
<tr>
<td>Snatch (150 Kg)</td>
<td>2000 N</td>
<td>3163 W</td>
</tr>
</tbody>
</table>
Sarcopenia = age related decline in muscle mass and strength

Starling et al. *Am J Clin Nutr* 1999

Muscle strength declines 30% (on average) from age 50-70, more dramatic losses after age 80
Large degree of variability between individuals
Power and Advancing Age

- Leg Strength
- Leg Muscle Area
- Leg Power
Power and Advancing Age

At Age 30
Strength = 10
Velocity = 10
Power = 100

At Age 70
Strength = 7
Velocity = 7
Power = 49

↓ 30%
↓ 51%
Dynapenia = age-related loss of muscle strength and power


- Great deal of focus on strategies to maintain muscle mass with aging because the rationale is that loss of strength is a direct result of loss of mass
- Recent evidence questions this relationship
- Sarcopenia’s role in age-associated strength loss (termed dynapenia) is exaggerated
- Alternative mechanisms underlie dynapenia and these need more attention


- Age-related loss of muscle strength is greater than the loss of mass
  - Health ABC Study found that change in quad CSA = 6-8% variance in knee extensor strength
- Low strength is much more strongly associated with low physical performance or disability than low mass
Relationship of Strength, Power and Function
Seminal Works


- Linked leg power to functional performance (timed chair rises, stair climbing and 6m walk)
Bean (2002), The relationship between leg power and physical performance in community dwelling mobility limited older people
Reid and Fielding (2012), *Skeletal muscle power: A critical determinant of physical functioning in older adults* (Eur J Appl Physiol)

Reid et al. (2011)
- Middle aged (47yrs), health OA (74yrs), mobility-limited OA (78yrs)
  - About 95% and 65% reduction in power, respectively
  - Only about 25% and 13% reduction in mass, respectively
- Muscle Quality (strength/CSA; power/CSA)
  - No change in specific strength
  - Deficits in specific power

- Other studies report deficits in neuromuscular activity during power testing suggesting that impairments in the neuromuscular system may be a major physiologic mechanism contributing to muscle power deficits and mobility limitations with advancing age
Reid and Fielding (2012), *Skeletal muscle power: A critical determinant of physical functioning in older adults*

Conclusions:

1. Muscle power is a more discriminant predictor of functional performance in older adults than muscle strength
2. Power training has been well-tolerated, safe and effective, even among frail older adults
3. Power training improves muscle power more than traditional strength training
4. Power training MAY improve physical functioning in older adults to a greater extent than traditional slow velocity strength training
Strength vs Power Training

- 12 studies that investigated PT on ADL functional ability as well as strength and/or power
- Good scientific rigor:
  - Most were RCT
  - 7/12 used a non-active control group
  - 9/12 had ST and PT groups
- 9/12 used traditional RT exercises performed explosively; 3/12 used functional exercises

- Wide variety of ADL tests were used, e.g. gait, stair climbing, sit to stand
- 10/12 PT groups showed significant improvements
- 4/9 ST groups showed significant improvements
- Within-study comparisons revealed that functional improvements for PT were either significantly greater (4) or similar (5) to ST
Hazell et al. (2007), *Functional benefit of power training for older adults* (Journal of Aging and Physical Activity, 15; 349-359)

Figure 1 — Differences for activities of daily living and strength reported from a variety of studies on older adults subsequent to 8–16 weeks of resistance or power training. Values are calculated differences and the subsequent averages for resistance-training studies (Brandon, Boyette, Gaasch, & Lloyd, 2000; Fittarone et al., 1994; Jette et al., 1999; Judge et al., 1994; Schlicht, Camaione, & Owen, 2001; Singh et al., 1997; Skelton & McLaughlin, 1994; Skelton et al., 1995; Westhoff, Stemmerik, & Boshuizen, 2000) and high-velocity-training studies (Bean et al., 2004; Earles et al., 2001; Fielding et al., 2002; Henwood & Taaffe, 2005; Hruda et al., 2003; Kongsgaard et al., 2004; Sayers et al., 2003).
Bean et al. (2010), *Are changes in leg power responsible for clinically meaningful improvements in mobility among older adults?* (J Am Geriatr Soc, 58; 2363-2368)

**Followup analyses of INVEST training study**

**Objectives**—Mobility as measured by the SPPB or habitual Gait Speed (GS) is predictive of mortality and disability among older adults. Clinically meaningful changes of these measures have been identified. Among physiologic attributes we sought to identify those attributes in which changes led to CMDs in the mobility outcomes.

**Results**—Participants were 68% female, mean age 75.2 years, with a mean of 5.5 chronic conditions and a baseline mean SPPB score of 8.7. After controlling for age, site, group assignment, and baseline outcome values, leg power was the only attribute in which changes were significantly associated with a large CMD in SPPB and GS.

**Conclusion**—Improvements in leg power, independent of strength, appear to make an important contribution towards clinically meaningful improvements in both SPPB and GS.
Bean et al. (2008), *Which impairments are most associated with high mobility performance in older adults? Implications for a rehabilitation prescription* (Arch Phys Med Rehabil, 89; 2278-84)

It is interesting that only the lowest tertile of strength and balance were significantly associated with mobility status, suggesting a possible threshold effect.

More specifically, this implies that impairment changes among those who are most impaired may have a very direct impact on physical function improvements, although changes in impairment among those less impaired, (eg, among healthier individuals) have little effect on physical function.

Similar findings were observed in a previous investigation of the InCHIANTI population and support the reported effect that these impairments may have curvilinear association with mobility status.

Interestingly, both tertiles of leg velocity had a significant influence on functional performance, suggesting that improvements in leg velocity may have functional consequences for a broader range of individuals.
Considerations for Power Training
Therefore, although injuries do occur in power-training research studies using resistance training machines, it appears that the risk is likely substantially higher for a fast walk and (or) jog program. In fact, the risks associated with power-training research primarily occur during testing, so power-training programs with little or no testing likely have a low risk for injury. (Porter 2006)
Equipment: Power and Inertia
Exercise Programming

Equipment: Pneumatic, elastic, bodyweight
Speed: Concentric “as fast as possible”, Eccentric “slow and controlled”
Load: 20-40% 1RM, variable
RPE can be used instead of 1RM
Sets & Reps: 2-3 x 8-12
Frequency: 2x wk
Movements: Lower body focus
Machine and free moving/floor
Exercise Movements

Frail/Lower Independent
- Power Stands
- Step Ups/Stair Climb
- Get Up and Go
- Chair Drills
- Red Light/Green Light

Independent/Average
- Power Stands/Jumps
- Line Hops
- Short Sprints
- What Time is It?
- Jumping Jacks
Exercise Movements

Fit/Athletic

- Plyometrics*
- Med Ball Throws
- Power Punch
- Power Row
- Hang Cleans
- Push Press
Specific Strategies and Techniques

- Balance Training
- Mobility
- Neuromuscular
- Musculoskeletal
- Cardiorespiratory
- Cognitive/Emotional

You MUST continue to gain knowledge and skill in specifically addressing each of these areas
Balance and Mobility Training

FallProof™ Model

1. Center of Gravity Control
2. Postural Strategies
3. Gait Pattern Enhancement and Variation
4. Multisensory
5. Fitness Parameters
   - Strength, Power, Flexibility, CV Endurance...
Balance and Mobility Training: Gait Exercises

Goal: Create an adaptable, flexible and efficient gait pattern

Marching
  Straight-leg
  In-line
  Crossover
  Backwards
  Pause
  Dog/Bush

Walking
  Narrow/Wide
  Heels/Toes
  Backwards

Obstacle Negotiation
  Sleeping Dog
  Steps
    Up/Down
    Swing Through
    Over
Sample Stations

**Posture Station (5 min total)**
- Supine Snow Angels (15 sec) (Rest 5 sec) X3
- Dead Bug (30 sec) (Rest 15 sec) X2
- Prone Snow Angels (15 sec) (Rest 5 sec) X3

**Plank Series**
- Front, Left Side, Front, Right Side (15 sec ea) (Rest 15 sec)
- Front, Left Side, Front, Right Side (15 sec ea) (Rest 15 sec)

**Balance Station (6 min total)**
- One leg balance (15 sec ea leg x 2)
- Walk the Line on Toes (15s fwd; 15s bwd)
- Forward Reach with Narrow Stance (15s ea arm x 2)
- Side Reach with Narrow Stance (15s ea arm x 2)
- Red Light, Green Light (60 sec)
- One leg balance (15 sec ea leg x 2)
- Walk the Line on Toes (15 sec fwd; 15 sec bwd)
- Forward Reach with Narrow Stance (15 sec ea arm x 2)
- Side Reach with Narrow Stance (15 sec ea arm x 2)
- Red Light, Green Light (60 sec)
Sample Stations

**Gait and Agility Station (6 min total)**
- Carioche Left and Right (30 sec)
- Square Stepping Clockwise (15 sec)
- Rest 15 sec
- Square Stepping Counterclockwise (15 sec)
- Rest 15 sec
- Tick Tock Walks (60 sec)
- High Knee March Fwd/Bwd on Toes (30 sec)
- Skipping (30 sec)
- Cross the Stream (60 sec)
- Rest 60 sec
- Repeat all

**Strength Station (6 min total)**
- Tall kneeling DB front raises to side raises (60 sec)
- Prisoner Get Ups alternating feet (60 sec)
- Rest 30 sec
- Squat to DB hammer curl (30 sec)
- DB deadlift to high pull (30 sec)
- Walking Lunges DB in Right Hand (30 sec)
- Walking Lunges DB in Left Hand (30 sec)
- Rest 30 sec
- Alternating DB curl to shoulder press (30 sec)
- Bent over one arm DB row to tricep kickback (30 sec ea side)
- Rest 30 sec
- Repeat Station
24” Box Jumps at 83?
Functional Program Design

• Prioritize Primary Areas of Individual Deficit for Significant Improvement
• Address ALL of the Secondary Areas for Maintenance or Slight Improvement
  – Neuromuscular
  – Musculoskeletal
  – Cardiorespiratory
  – Balance
  – Mobility
  – Cognitive/Emotional
• For Efficiency Use Movements that Address Multiple Components Simultaneously
• Use Corrective Exercise Strategies as needed
The Aging Opportunity

- Traditionalist or silent generation (seniors)
- 28 million
- Baby Boomers
- 76 million
- Gen Xers (already turning 50)
- 64 million
FAI Programs

CEC’s – ACE, AFAA, NFPT, ACSM, NASM, AFN

Completely online
• 13 educational modules
• 5 hours of video
• 90 question test

Coupon FitnessFest
The Aging Opportunity

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on Amazon

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for Personal Trainers
Who Want MORE
Affluent Clients

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FASmarketingbook.com

How to Get 50+
BOOMER FITNESS
CLIENTS FAST

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