The Masters Athlete and The Disabled Athlete

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Overview

• Define masters athlete
• Review of physiology of aging
• Identify pertinent sport restrictions as guided by screening
• Focus attention to proper exercise
• Discuss clearance issues for injury
• Educate athletes to avoid future injury
• Discuss common injury for the disabled athlete
The Masters Athlete

• Growing aging population “Baby Boomers”
• National Senior Games (>50 yr)
  • 1987: 2,500 participants
  • 2013: 10,881 participants
• NYC Marathon
  • 1983 → 1999: 119% increase
  • 1987 winner: Priscilla Welch (42y)
• 1994 Eamonn Coghlan runs 1st sub 4 min mile (41y)
• 2005 Kozo Haraguchi world rec 100m 22.04s (95y)
The Aging Population

• National Health Interview Survey
  • 23% adult exercise ≥30 min daily, 3x weekly
  • 29% adults 65y + completely sedentary

• Sedentary persons
  • 65-75y young old
  • 75-85y middle old
  • 85y+ very old

• Chronically ill: 50-64y
Defining the Masters Athlete

- Age 35
- World Masters Athletics: international events & standards for age
  - Swimmers 18y
  - Track & Field 35y
  - Golf 50y
- Newcomers to sport & exercise
- Prior competitive, prominent career
- Return to sport after inactivity / wkend warrior
- Compete against self & others
Balancing Goals

**Athlete**
- Competition
  - Others
  - Clock
  - Younger self
  - Younger competitors
- Improve fitness/performance
- Personal achievement
- Team atmosphere
- Independence
- Quality of life

**Physician**
- Benefits of continued exercise¹
  - ↓ CV, Obesity, DM Risk
  - ↑ BMD
  - ↓ Fall risk  ↑Strength
  - ↓ Dementia & Depression
  - ↑ Self-esteem  ↓Anxiety
- Educate natural physiology
- Realistically refine goals
- Maintain competitive spirit
- Exercise prescription

¹ US DHHS 2008 physical activity guidelines
Physical Fitness Benefits

- Improved physical / mental health
- Enhancement of brain function and cognition\(^1\)
  - Increased blood and oxygen flow to the brain\(^2\)
  - Increased norepi and endorphins, improved mood\(^3,4,5\)
  - Increased GF encourage synaptic plasticity\(^6\)

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Physiology of Aging

- \( \text{VO}_2\text{max: peak aerobic power} \)
- Natural decline in peak O2 transport at 50yr (5-10% per decade)
- Progressive inactivity, \( \uparrow \) body fat & deconditioning
- Sacropenia \( \uparrow \)
  - \( \downarrow \) muscle performance: late 30s
  - Endurance & sprinting \( \downarrow \) 75% of peak performance 60-70y
- Loss of Type II Muscle fibers
- Slow decline with maintaining activity
Pre-participation Screening

- Hypertension
- Cardiovascular Screening
- Heat illness
- Bone mineral strength
- Diet / nutrition
- Cardiovascular exercise
- Weight training
- Osteoarthritis
- Joint Replacement
General Physical Exam

• Routine Snellen Testing – vision loss
• Screen for DM, Anemia, Renal disease
  • BMP, HbA1C, CBC, Iron studies

Contraindications to exercise in the elderly

- Acute febrile illness
- Acute unstable chest pain
- Uncontrolled diabetes, hypertension, asthma, congestive heart failure, severe aortic stenosis
- New falls, musculoskeletal pain
Hypertension

• Correct cuff size & Multiple measurements (3)
• Consider medications
  • Cold / Allergy meds
  • Caffeine, EtOH use
  • Steroids / PES
• Moderate - Severe Hypertension
  • Restrict from highly static (isometric) sports
  • Avoid heavy weight lifting, power lifting
  • Large intramuscular forces: ↑ Systolic, Diastolic & MAP
  • OK to return to exercise once BP improves, follow q2 mo
• Restrict if resting
  • systolic ≥ 200mmHg
  • diastolic ≥ 115mmHg
<table>
<thead>
<tr>
<th>Increasing Static Component</th>
<th>Increasing Dynamic Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Low (≤20% MVC)</td>
<td>40-70% Max O₂</td>
</tr>
<tr>
<td>II. Moderate (20-50% MVC)</td>
<td>40-70% Max O₂</td>
</tr>
<tr>
<td>Archery, Auto racing*, Diving*, Equestrian*, Motorcycling*</td>
<td>American football*, Field events (jumping), Figure skating*, Rodeoing*, Rugby*, Running (sprint), Surfing*, Synchronized swimming*</td>
</tr>
<tr>
<td>III. High (&gt;50% MVC)</td>
<td>&gt;70% Max O₂</td>
</tr>
<tr>
<td>Basketball*, Ice hockey*, Cross-country skiing (skiing technique), Lacrosse*, Running (middle distance), Swimming, Team handball</td>
<td>Basketball*, Cross-country skiing (classic technique), Field hockey*, Orienteering, Race walking, Racquetball/Squash, Running (long distance), Soccer*, Tennis</td>
</tr>
</tbody>
</table>

A. Low (≤40% Max O₂)  
B. Moderate (40-70% Max O₂)  
C. High (>70% Max O₂)
CV Screening

• CAD m/c cause sudden cardiac death athletes ≥ 40y\textsuperscript{1,2}
• Unaccustomed vigorous activity > less intense activity
• Cardiac history:
  • Exertion related syncope, chest pain
  • Palpitations
  • BP, cholesterol, murmur, cardiomyopathy
  • EKG, echo
  • FHx: Heart prob <50yo, Marfans, Sudden death
• Cardiac PE:
  • Auscultate rate, rhythm, murmur
  • Assess changes sitting, supine, standing, squatted
  • Pulses
CV Screening

• EKG all ≥40 y

• ECG exercise testing:
  • Men ≥40 y and Women ≥50y with 1 cardiac risk factor: Dyslipidemia, HTN, Tobacco use, DM, Hx MI/SCD < 60 yo
  • ≥65y low risk
  • ≥60y symptomatic CAD

• Echo:
  • Documented CAD
  • Inducible ischemia
CV Restrictions

• Restrict high-intensity sports
  • LV EF ≤ 50%
  • Exercise-induced myocardial ischemia
  • Ventricular arrhythmia
  • Systolic hypotension
Diabetic Athlete

- ↑ frequency of BG check & carb correction before, during & after
- Decrease insulin requirements
- Alert team, hypoglycemic plan
- Peripheral Neuropathy: proper footwear
- Nephropathy: BP ≤ 200 mmHg
- Retinopathy: avoid rapid ↑BP (static exercises)
Heat Illness and Elderly

- **INCREASED:**
  - Time to acclimate
  - Excretion urinary water
  - Sweat threshold

- **DECREASED:**
  - Sweat Capacity
  - Ability to maintain thermostasis at temp extremes
  - Cutaneous vasodilation
  - Thirst drive
Heat Illness

- Cause: heat retention
  - Undue physical exertion
  - Insufficient recovery between exercise
  - Inappropriate clothing/uniforms/protective equipment
- Preventable
  - Avoid participation if recently ill
  - Closely monitor s/s heat illness
- Modify activity if humid
- Increase hydration if history of heat illness
- Longer rest tournament play
Heat Illness

• Educate
  • Pre-Event: 16-20 oz 2-3hr then 8-10 oz 10-20 min
  • During Game: every 20 min / Event Thirsty
  • Post: Until urine clear & replace over 2 hr
  • Thirsty = drink
  • Don’t restrict fluids, salt
  • Water is best fluid to drink, no calories!
  • Extra water breaks

• Acclimation period 10-14 days

• Teach s/s of dehydration, heat illness, heat stroke
Nutritional Requirements

• ↓ resting metabolic rate, energy expenditure and lean body mass
• ↑ protein while maintaining carb:fat ratio
• ↓ ability to syn Vit D, abs Ca$^{+2}$ and Vit B$_{12}$
  • Supplementation Vit D 2000IU/day
  • Ca$^{+2}$ 1500 mg/day
  • 1.5 x RDA B$_{12}$
• Eat throughout the day with snacks
• Carb w/in 1 hour exercise
• Protein & Carb (0.7-2 g/kg) recovery p exercise
# ACSM Exercise Recommendations for Healthy Adults

<table>
<thead>
<tr>
<th>Type of Training</th>
<th>Frequency</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic</td>
<td>3-5 days per week for 20-60 minutes per session</td>
<td>55% to 95% of maximum heart rate for moderate to vigorous intensity; light intensity for deconditioned adults or those with chronic diseases</td>
</tr>
<tr>
<td>Resistance</td>
<td>2-3 days per week</td>
<td>2-4 sets of 8-20 repetitions incorporating all major muscle groups</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Minimum 2-3 days per week</td>
<td>Incorporated into existing routine, repeat stretch 2-4 times for total of 60 seconds per stretch</td>
</tr>
<tr>
<td>Balance</td>
<td>2-3 days per week</td>
<td>20-30 minutes per neuromotor or proprioceptive exercise session</td>
</tr>
</tbody>
</table>

\(^{10}\)From American College of Sports Medicine position stand on the recommended quantity/frequency and quality of exercise for developing and maintaining cardiorespiratory, muscular fitness, flexibility, and balance in healthy adults.
Physical Fitness Recommendations

• Defining “intensity”

• MET – metabolic equivalent\(^1\)
  • Estimate of energy expenditure (ee)
  • 1 MET = ee when sitting quietly
  • Light < 3.0 METs
  • Moderate 3.0 to 6.0 METs
  • Vigorous > 6.0 METs

\(^1\) Ainsworth MSSE 2000
<table>
<thead>
<tr>
<th>Light &lt; 3 MET</th>
<th>Mod 3-6 METs</th>
<th>Vigor &gt; 6 MET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking slowly 2.0</td>
<td>Walking 3mph = 3.3 4mph = 5.0</td>
<td>Jogging 5mph = 8 7mph = 11.5</td>
</tr>
<tr>
<td>Light work at home 2-2.5</td>
<td>Sweeping / Cleaning 3 to 3.5</td>
<td>Heavy lifting / manual labor 7-8.5</td>
</tr>
<tr>
<td>Sitting at desk 1.5</td>
<td>Biking 6.0</td>
<td>Basketball game 8.0</td>
</tr>
<tr>
<td>Playing an instrument 2-2.5</td>
<td>Tennis doubles 5.0</td>
<td>Soccer 7-10</td>
</tr>
<tr>
<td>Fishing 2.5</td>
<td>Golf 4.3</td>
<td>Swimming 8-11</td>
</tr>
</tbody>
</table>
Physical Fitness Recommendations

• Healthy People 2020 (released 2010)
  • Aerobic PA ≥ 60 min, 7 d/wk
  • Muscle strengthening ≥ 3 d/wk
  • Aerobic and muscle strengthening should be combined
  • Target HIGH risk populations

Little is better than none!
Exercise

• Start slow!
  • Build a routine, rest 1d/wk
  • 10 min sessions to increase compliance
  • Increase 10% / wk

• Mix up stretching, strengthening, cardio
  • Need time to adapt
  • Prevent boredom

• Low impact is good
  • Pool, bike, elliptical, walking

• Weight Training
  • Start low, high repetition
Weight Training

• No power / max lifts
  • Ballistic motions at extreme end ROM
  • Power clean, clean and jerk, dead lift
  • Incline, overhead press

• Emphasis on proper form

• High reps, low weight
Master’s Athlete Injuries

• M/C sports related injury – tissues less durable
• Require longer rehab & recovery – difficulty healing
• Survey masters athletes
  • Days of Restriction: 7d 60%  
    >21d 33%
  • Athletes ≥70, 20% reported persistent pain 1 yr post injury

• Osteoarthritis
  • XR Knee weight bearing 45 degree flexion: Rosenberg view
  • Repetitive high loading (running) controversial
  • Low-moderate impact no risk
  • Simple quadriceps strengthening program ↓pain ↑ funct
<table>
<thead>
<tr>
<th>Joint loading level</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Recreational swimming</td>
</tr>
<tr>
<td></td>
<td>Stationary rowing, cycling, or</td>
</tr>
<tr>
<td></td>
<td>skiing</td>
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<tr>
<td></td>
<td>Tai Chi</td>
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<tr>
<td></td>
<td>Low-impact aerobics</td>
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<tr>
<td></td>
<td>Golf</td>
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<tr>
<td></td>
<td>Walking</td>
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<tr>
<td></td>
<td>Water aerobics</td>
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<tr>
<td></td>
<td>Calisthenics</td>
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<tr>
<td></td>
<td>Downhill skiing</td>
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<tr>
<td></td>
<td>Sailing</td>
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<tr>
<td>Moderate</td>
<td>Bowling</td>
</tr>
<tr>
<td></td>
<td>Speed walking</td>
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<tr>
<td></td>
<td>Fencing</td>
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<tr>
<td></td>
<td>Cross-country skiing</td>
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<tr>
<td></td>
<td>Bicycling</td>
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<tr>
<td></td>
<td>Table tennis</td>
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<tr>
<td></td>
<td>Rowing</td>
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<tr>
<td></td>
<td>Canoeing</td>
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<tr>
<td></td>
<td>Ice skating</td>
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<tr>
<td></td>
<td>Hiking</td>
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<tr>
<td></td>
<td>Rock climbing</td>
</tr>
<tr>
<td></td>
<td>Horseback riding</td>
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<tr>
<td></td>
<td>Doubles tennis</td>
</tr>
<tr>
<td></td>
<td>Inline skating</td>
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<tr>
<td>High</td>
<td>Baseball/softball</td>
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<tr>
<td></td>
<td>Lacrosse</td>
</tr>
<tr>
<td></td>
<td>Basketball</td>
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<td></td>
<td>Soccer</td>
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<tr>
<td></td>
<td>Volleyball</td>
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<tr>
<td></td>
<td>Rugby</td>
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<tr>
<td></td>
<td>American football</td>
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<tr>
<td></td>
<td>Singles tennis</td>
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<tr>
<td></td>
<td>Handball/racketball</td>
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<tr>
<td></td>
<td>Squash</td>
</tr>
<tr>
<td></td>
<td>Competitive running</td>
</tr>
</tbody>
</table>

(Data from Buckwalter and Martin [41••].)
Master’s Athlete Injuries

• Joint Arthroplasty
  • Avoid return to high-impact activity but may return to low-impact sports
  • Implant loosening, fracture, worse prosthesis survival
  • Balance: ↓ BMD from little activity & ↑ wear on device

<table>
<thead>
<tr>
<th>Allowed</th>
<th>Allowed with Experience</th>
<th>Not Allowed</th>
<th>No Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golf</td>
<td>Doubles tennis</td>
<td>Football</td>
<td>Singles Tennis</td>
</tr>
<tr>
<td>Bowling</td>
<td>Alpine Skiing</td>
<td>Basketball</td>
<td>Martial Arts</td>
</tr>
<tr>
<td>Cycling</td>
<td>Nordic Skiing</td>
<td>Soccer</td>
<td></td>
</tr>
<tr>
<td>Hiking</td>
<td>Weightlifting</td>
<td>Running</td>
<td></td>
</tr>
<tr>
<td>Dancing</td>
<td></td>
<td>Snowboarding</td>
<td></td>
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</tbody>
</table>
### Table 1. American College of Sports Medicine position stand: physical activity and bone health

**To preserve bone health during adulthood**

**Mode:** weight-bearing endurance activities (tennis, stair climbing, jogging, jumping activities, resistance training)  
**Intensity:** moderate to high, in terms of bone loading forces  
**Frequency:** weight-bearing endurance activities 3–5 times per week, resistance exercise 2–3 times per week  
**Duration:** 30–60 minutes daily of a combination of weight-bearing endurance activities, activities involving jumping, and resistance training exercises

Exercise programs for elderly women and men should include not only weight-bearing endurance and resistance activities aimed at preserving bone mass, but also activities designed to improve balance and prevent falls.
The Disabled Athlete
Injuries Among Disabled Athletes

• Rate similar to able bodied athletes
• Limited epidemiological studies
• Cross disability retrospective study: 426 athletes
  • National competition NWAA, USBA, USCPAA
  • 32% reported 1 injury prior 6 mo
  • 57% NWAA UE
  • 53% blind LE
  • MC athlete: CP
    • Knee 21% > Ankle> Shoulder
Autonomic Dysreflexia

- T6 and above SCI athletes: lack of suprspinal neuro inhibition, SNS unchecked
  - Headache
  - Piloerection
  - Sweating
  - Paroxysmal HTN
  - Bradycardia
- Noxious stimuli below SCI: pressure sores, UTI, tight clothes, distended bowel/bladder
- Tx: remove stimuli, HTN 10mg nifedipine SL
- Boosting
Pressure Sores

- Improperly fitted prosthetics
- Wheelchair athletes

Tx:
- Proper positioning in chair, correctly fit equipment
- Regular pressure reliefs: Lift off the seat 10-20 sec/d
- Cushion
- Wicking or reducing skin moisture
- Minimizing skin shear
Thermoregulation

- Loss of muscle mass
- Loss of motor neural control
- Dec input to hypothal reg centers
- Ineffective shiver response to maintain core temp

- Watch for clothing dampness
- Thermo monitor during and after activity
- Rapid cooling
Venous Blood Pooling

• SCI Diminished reflexive control of blood flow
• Hypovolemic athlete 2/2 dehydration
• Hypotension risk due to medications
• Diminished CO

• TX: Abdominal binder, compression garment, or functional electrical stimulation
Alanto-Axial Instability

- Down’s Syndrome patients
- Flexion and extension cervical spine x-rays
- Measure movement of anterior ring C1 on odontoid process C2
- >5mm instability

- 17% patients with DS
- Risk with forward flexion
- Evaluate yearly
QUESTIONS?

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