Exercising with Chronic Disease

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Learning objectives:

- Describe effects of age on athletic performance
- Discuss exercise in chronic disease
- Recommend exercise after joint arthroplasty

Case 1.

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Normal or Abnormal?

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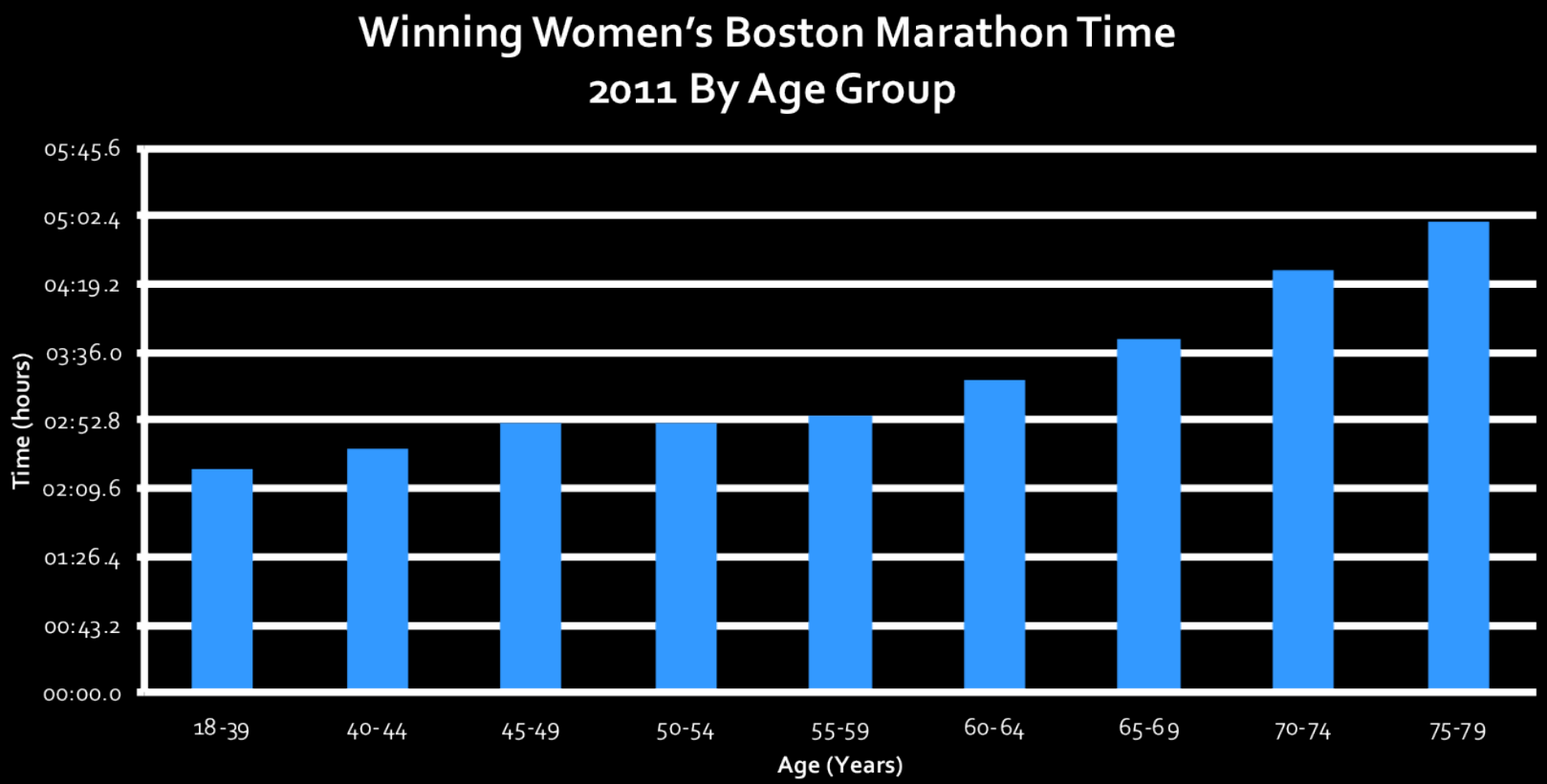
Normal aging



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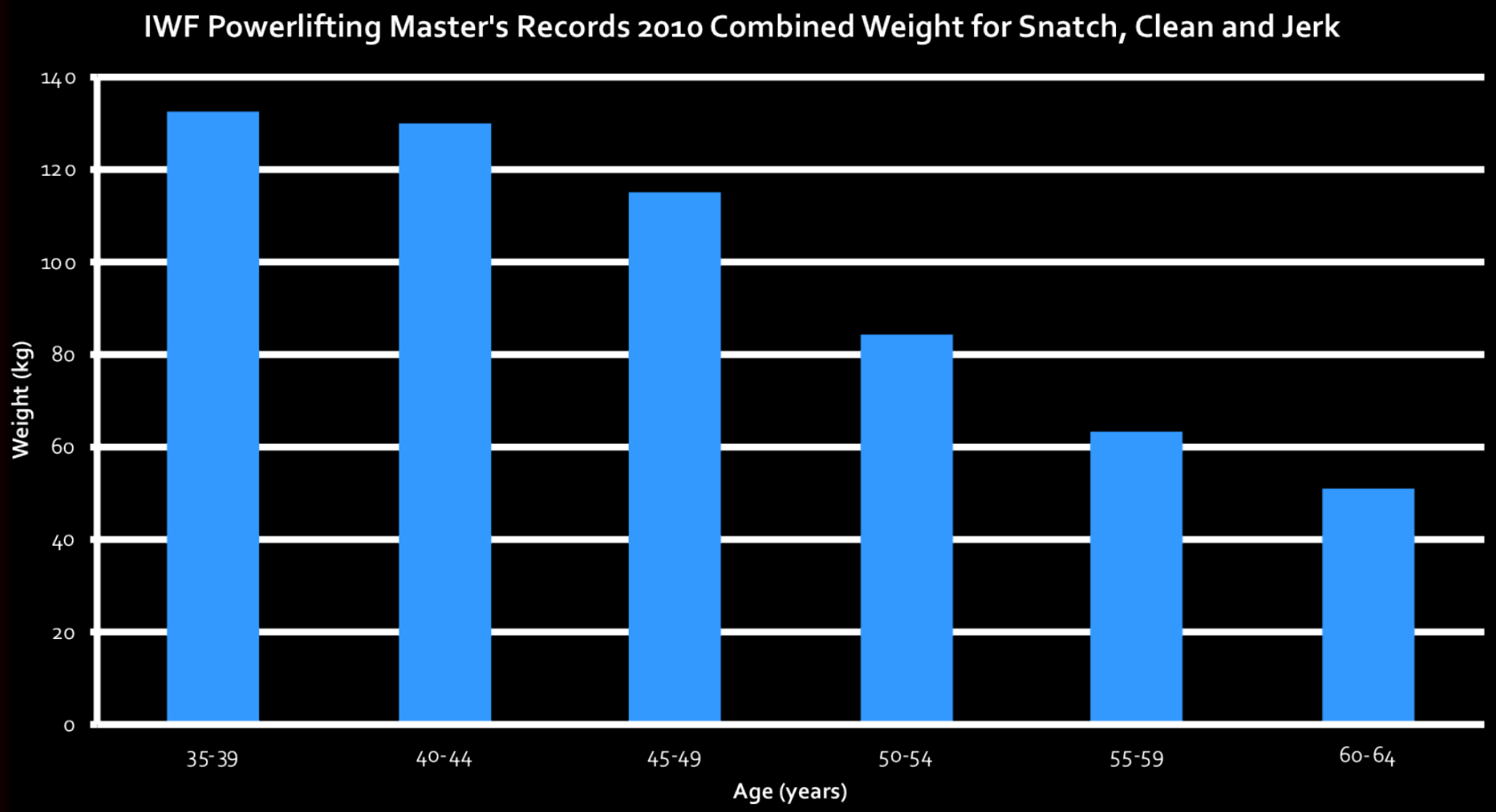
Normal aging



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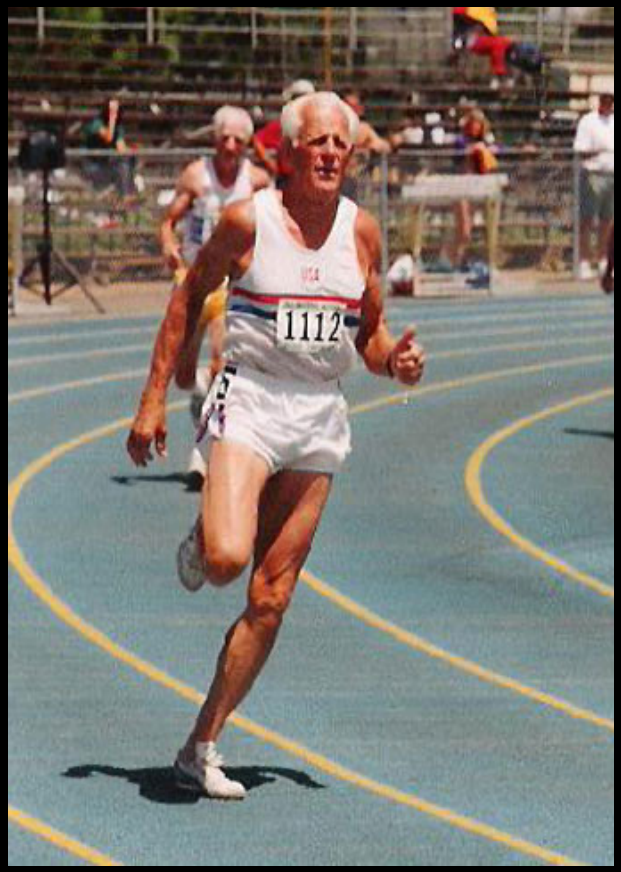
Age-related adaptations:

- Decreased muscle strength, mass, function
  - Strength reduced 20% by age 65
- Decreased endurance: muscle mass, capillary blood flow, impaired oxygen uptake
- Decreased flexibility- lack of regular movement through a full ROM
  - Flexibility reduced 20% by age 65
- Decreased balance- inactivity, deconditioning, chronic diseases (PVD, DM, PD ,neuropathy), nutritional deficiencies

Age-related adaptations

- CV:
  - Decreased:
    - HR max
    - Vascular compliance
    - Resting stroke volume
    - Maximum CO
- Pulmonary:
  - Increased residual volume
  - Reduced vital capacity



Images wiki commons

Age-related adaptations

- Metabolic: decreased VO2 max
- Neuro:
  - Decreased nerve conduction velocity
  - Diminished proprioception
- Bone:
  - BMD loss 1%/yr starting age 35
  - BMD loss increases after age 55

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Summary- 7-14% aerobic/anaerobic decline per decade in endurance athletes (Scand J Med Sci Sports 2019)

But if we exercise:

- Strength training
  - Increase strength, endurance, BMD
  - Increase submaximal aerobic capacity
  - Reduce BP, fall risk, OA pain, disability
- Aerobic exercise
  - Improved efficiency, endurance, oxygen uptake, chronic diseases
  - Reduced resting HR
- Balance
  - Reduced fall risk, fewer fractures
- **Flexibility**: improved ROM

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Exercise in Chronic Disease

- Regular exercise attenuates long-term effects of chronic disease
- Chronic diseases impact masters athletes

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Dementia

- Exercise has not been shown to **prevent** dementia
  - ? Regular exercise 35-55, small study
- Exercise improves cognitive function & ADLs in those with MCI
- Exercise improves cognitive function & ADLs in those with dementia

- Zheng et al (BJSM 2016)
  - 1497 MCI patients
  - 11 RCTs
  - 6-12 months of regular aerobic exercise
  - PA group- improved 1 point on MMSE, improved immediate/delayed recall

Hypertension

- Acute effect of exercise on BP:
  - SBP reduced 15 mmHg
  - DBP reduced 4 mmHg
  - Lasts 4-10 hrs (up to 22 hrs)
- Chronic effects of exercise on BP:
  - Endurance, dynamic resistance, and isometric resistance training improves SBP/DBP (Cornelissen & Smart 2013)
  - Aerobic training in previously sedentary adults-
    - 3.9% reduced SBP
    - 4.5% reduced DBP (Huang 2013)

Hypertension

- Meta-analysis of 1 million patients (calculated):
- If we reduced SBP by 2 mmHg…
  - Stroke mortality drops by 10%
  - Ischemic cardiac mortality drops by 7%

  (Lewington et al 2002)

  - CONTRAINDICATION- avoid exercise if BP > 200/110 until pharmaceutically controlled

Coronary artery disease

- Supervised exercise-based cardiac rehab vs. "usual care"
  - Reduced cardiovascular mortality (but not all-cause mortality)
  - Fewer hospital readmissions
  - Reduced LDL/TG levels
  - Reduced SBP
- Start:
  - 1 wk post revascularization (PTCA/stent)
  - 4-6 weeks post CABG
- Exercise contraindications
  - Severe CAD w/unstable angina
  - Severe aortic/carotid stenosis

Congestive Heart Failure

- CHF
  - Reduced exercise performance
  - Decreased VO_2 max
  - Reduced strength
- Exercise-based rehab improves:
  - VO_2max
  - SBP
  - Ventilation
  - Resting HR
  - But not mortality

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- Contraindications: NYHA IV, worsening dyspnea, weight gain > 1.8 kg, exertional ventricular arrhythmias

Type II Diabetes

- Global prevalence expected to increase from 171 million in 2000 to 363 million in 2030
- Lack of fitness is an independent risk factor for mortality in DMII
- PA improves glycemic control
  - Reduces insulin resistance
  - Reduces BP
  - Increases VO2max
  - Increases strength

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Type II Diabetes

- Aerobic, resistance training, or both reduces HbA1c levels
  - > 150 min/wk better than < 150 min/wk (Umpierre 2011)
- Aerobic vs. resistance training (Yang 2014)
  - No difference in CV risk markers, glucose control, or safety
- Cautions:
  - Monitor BS during/after exercise
  - Consume 10-20 g carbs prior to exercise
  - Recommend cushioned footwear
  - Don't inject insulin into an exercising body part

COPD

- COPD
  - Irreversible reduction in pulmonary function
  - QOL (but not pulmonary function) improved with endurance training
    - Reduced fatigue
    - Reduced dyspnea
  - Aerobic vs resistance training
    - No difference

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Peripheral vascular disease

- Reduced tissue perfusion
  - Slower walking, less ambulatory time
  - Exercise improves:
    - Pain tolerance
    - Fitness
    - Strength
    - Walking distance (supervised program, push through pain)

Osteoarthritis

- Most common form of arthritis
- Common cause of pain, loss of function, disability
- Non-operative treatment approaches
  - **EXERCISE**
  - NSAIDs/acetaminophen
  - Weight loss if appropriate
  - Bracing
  - Injections
  - When all else fails, arthroplasty

Exercise and OA

- Land and aquatic-based programs are effective
- Land-based- moderate/high quality evidence
  - Mix of low/moderate impact aerobic exercise with lower extremity strength training improves pain and function
  - Cochrane review (2015)
    - Moderate effect, similar to oral NSAIDs
    - Safe, low risk of cartilage damage
    - Individualized, and PT can help
    - Needs to be sustained
    - Should be recommended for all patients
- Aquatic exercise- less data, best for mobility-impaired

Additional OA therapies

- NSAIDs/acetaminophen
- Duloxetine
- Weight loss if appropriate
- Bracing
- Injections
  - Steroid
  - Hyaluronic acid
  - PRP?

- When all else fails, arthroplasty

Return to sport after arthroplasty

- Exercise is good
- Arthroplasty is done to relieve pain and allow return to activity and exercise
- The activity level should not cause early failure of the arthroplasty

Exercise recommendations for patients:

- Valid comparative studies
  - Ho, JC (2016) 40 TKA patients
  - 75% high-impact sports prior to TKA
  - 93% returned to high impact sports after TKA
- Patient evaluation, expectations, goals
- Clinical experience
- Expert consensus opinion

2007 AAHKS Consensus Guidelines

- Recommended/Allowed
- Allowed with experience
- Not recommended
- No conclusion

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Healy et al, JBJS 2008

Recommended/Allowed

Low-impact aerobics	Golf
Stationary bicycling	Dancing
Bowling	Croquet
Horseback riding	Horseshoes
Walking	Shuffleboard
Swimming	Shooting

Healy et al, JBJS 2008

Not recommended

Racquetball	Squash
Rock climbing	Soccer
Singles tennis	Volleyball
Football	Gymnastics
Lacrosse	Hockey
Basketball	Jogging
Handball	

Healy et al, JBJS 2008

Allowed with experience

Road bicycling	Cross-country skiing
Canoeing	Rowing
Hiking	Stationary skiing
Speed walking	Tennis
Weight machines	Ice skating

Healy et al, JBJS 2008

No Conclusion

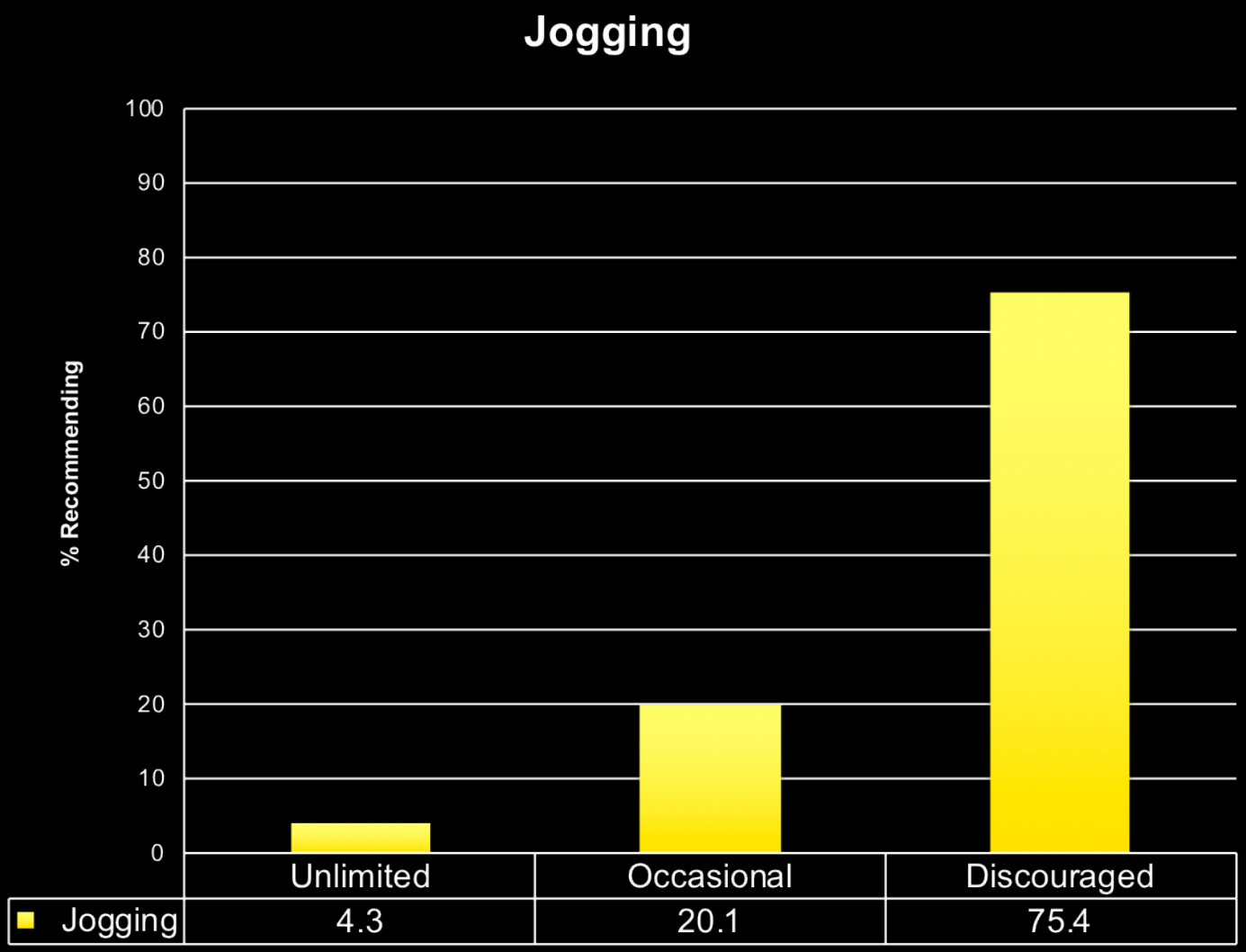
Fencing

Roller blade/inline skating

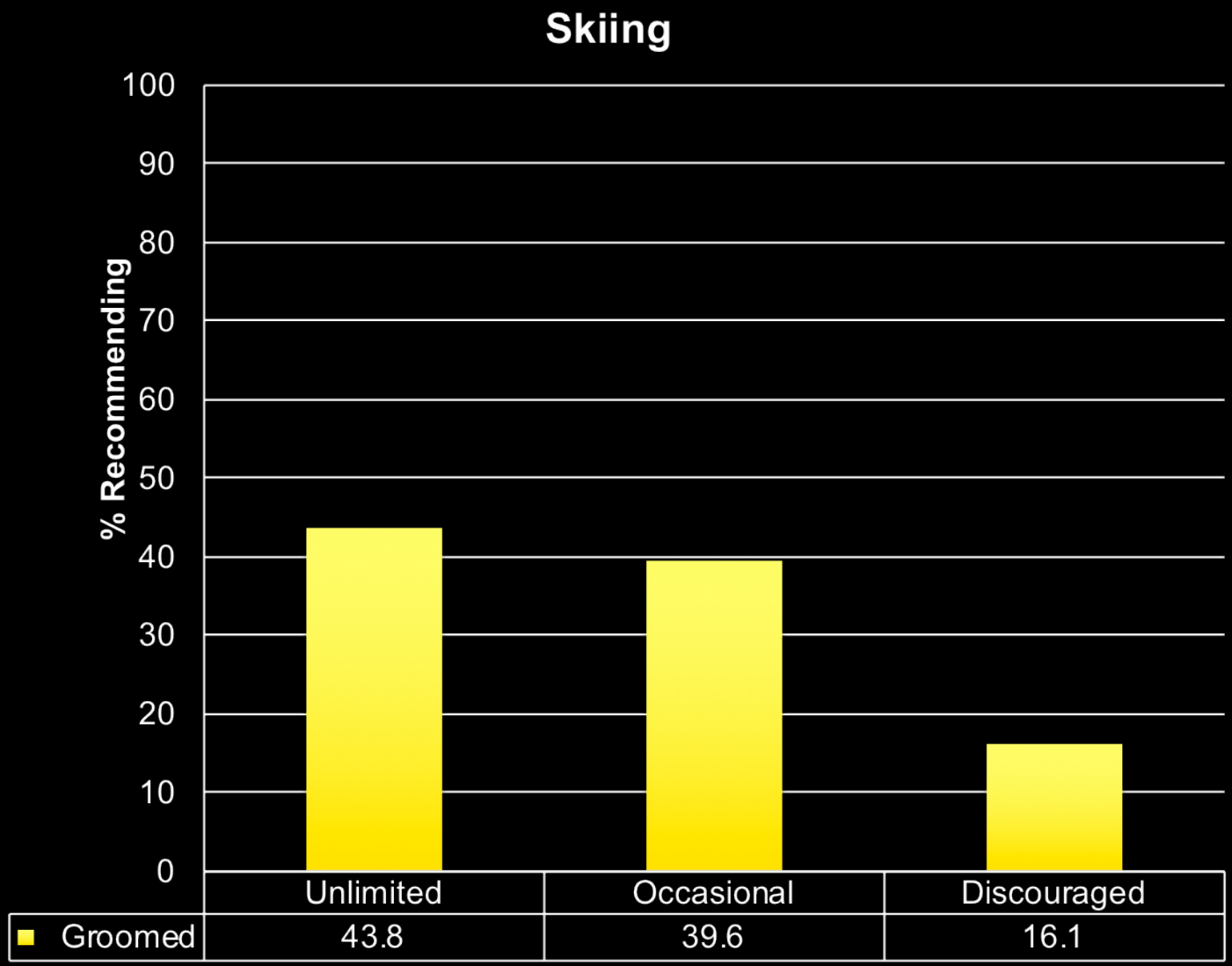
Downhill skiing

Weight lifting

Healy et al, JBJS 2008



Swanson,Schmalzried,Dorey, Activity Recommendations After Total Hip and Knee Surgery.J Arthroplasty 2009;120



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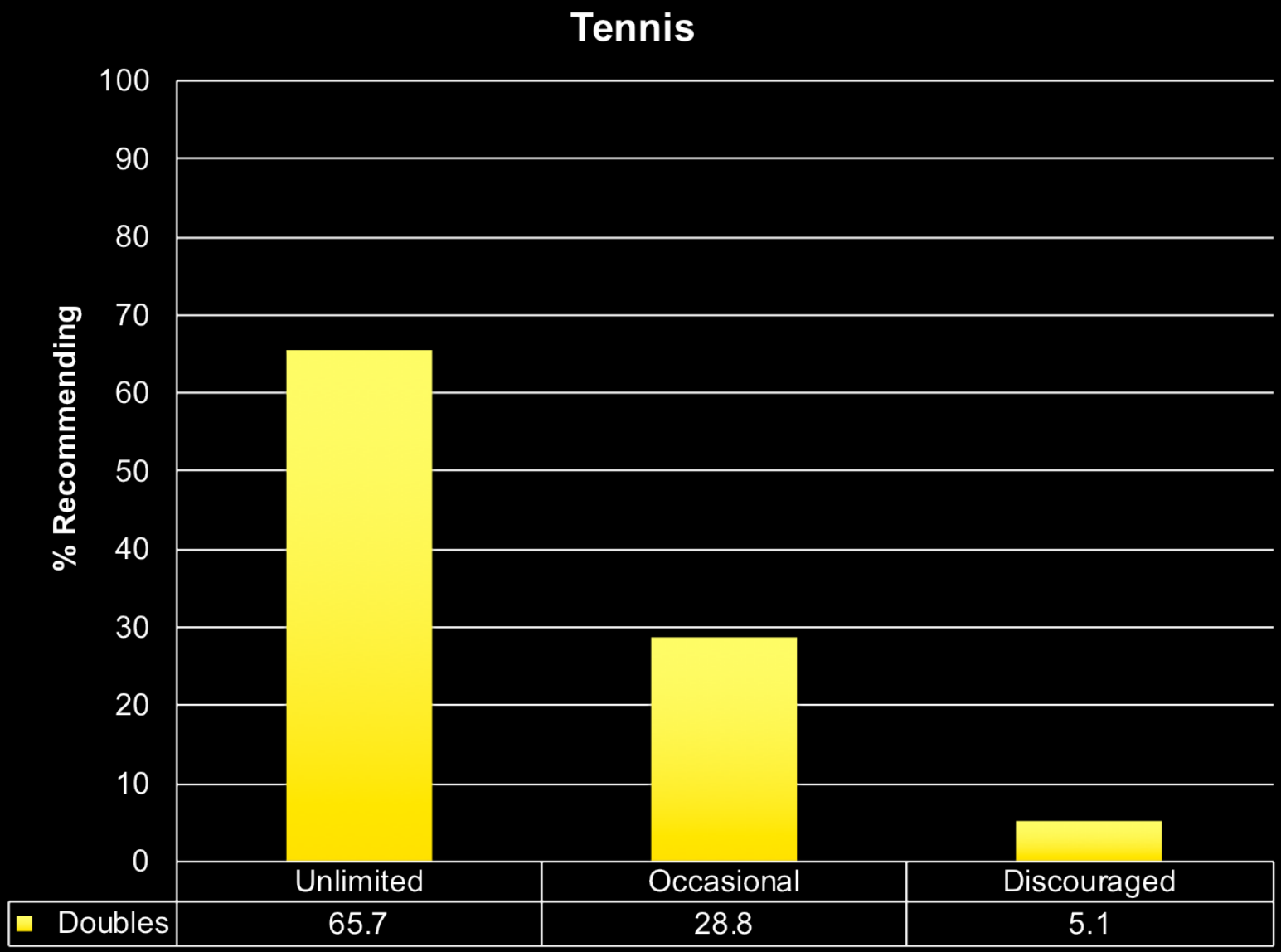

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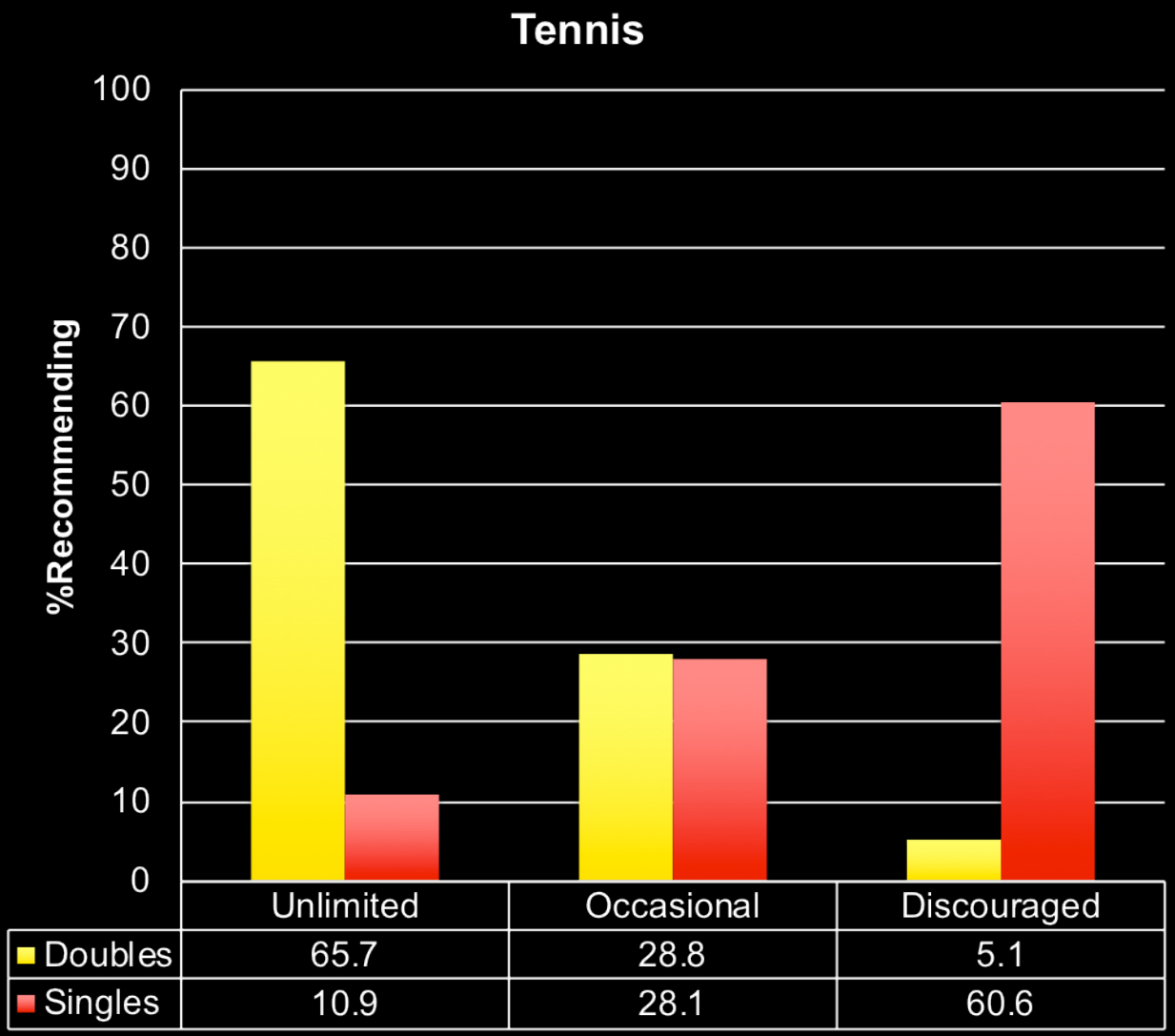

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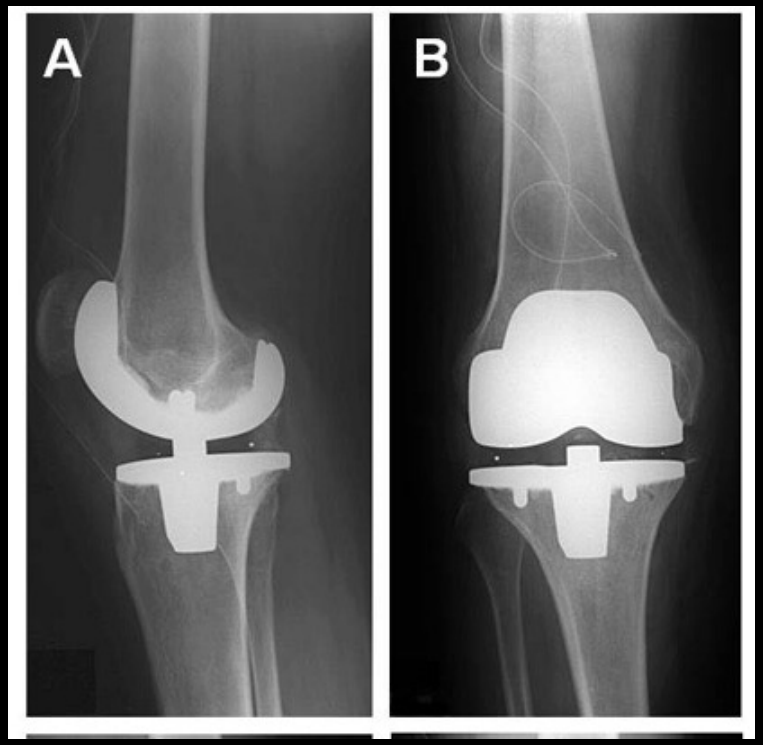
Clin Ortop Relat Res(2008)466:2605-2611



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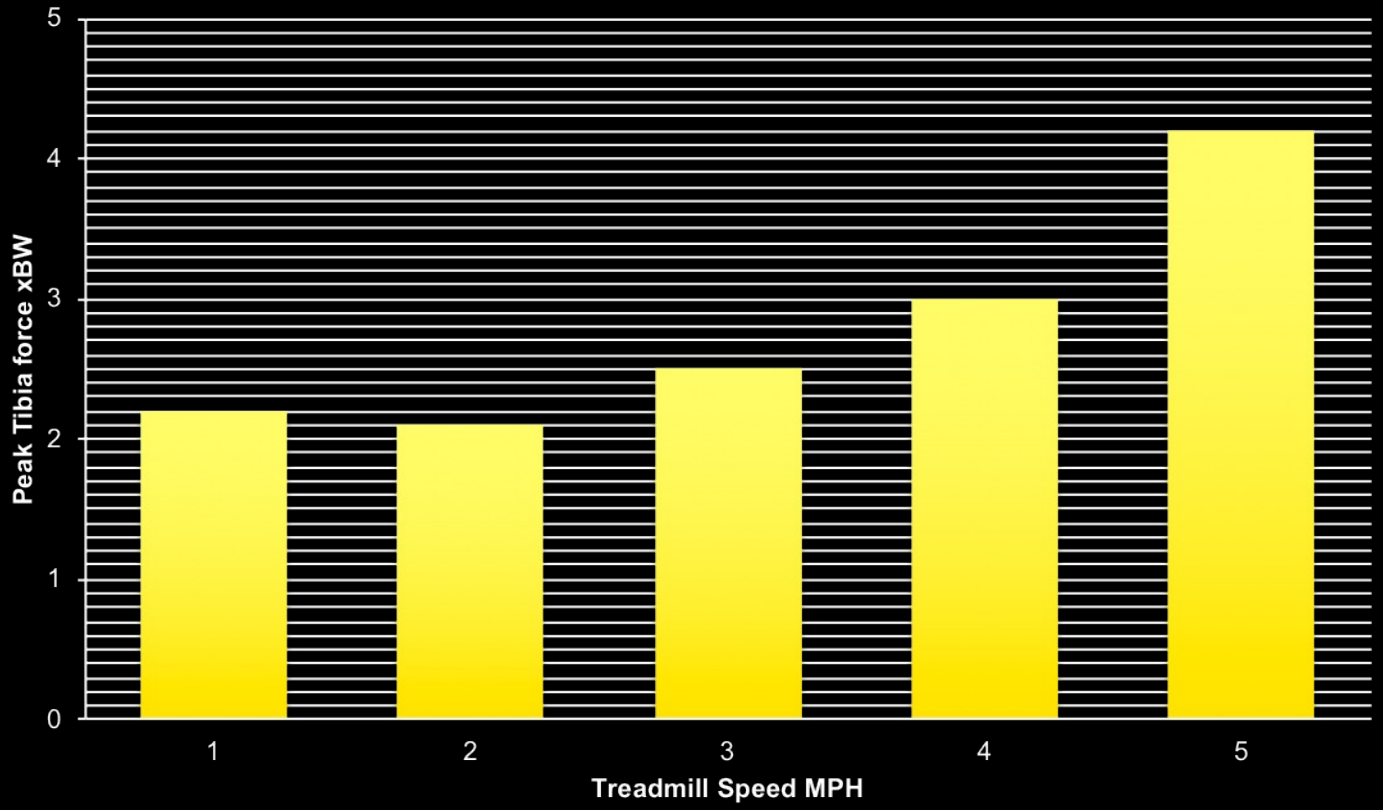
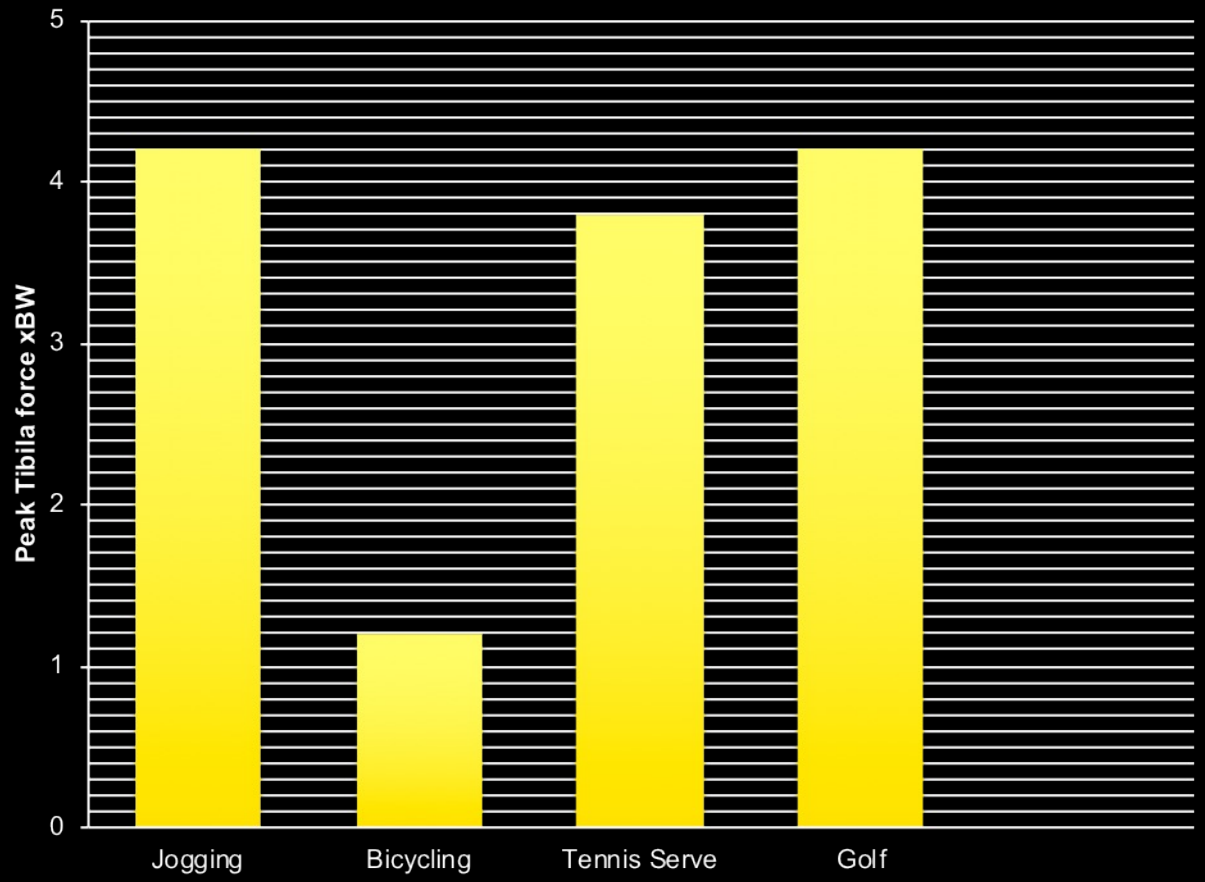
- 3 subjects
- Standard TKA
- Instrumented tibial tray
- Force generated with activities compared to body weight

Treadmill



Forces:


Peak Tibila force xBW
5
4
3
2
1
0
Jogging
Bicycling
Tennis Serve
Golf

Recommendations for Individual Patients

- Start with expert consensus opinion-2007 AAHKS Recommendations
- Patient evaluation
- Clinical experience

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Learning objectives:

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Thank you

Photo Amy Powell