

## Development of Evidence-Based Exercise Recommendations for Older HIV-Infected Patients

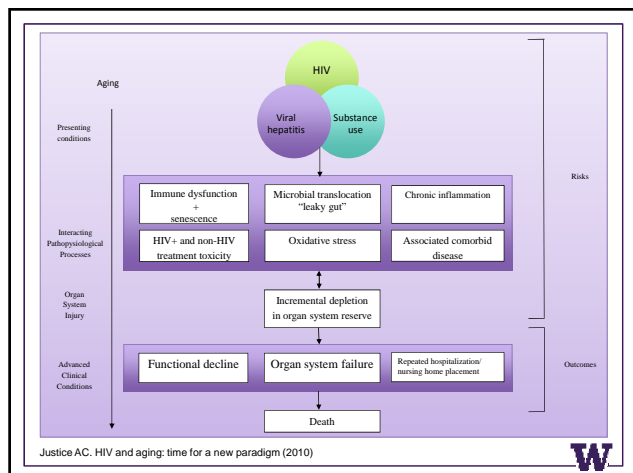
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## HIV & Aging

- In 2005, 24% of people living with HIV (PLWH) in the U.S. are over the age of 50<sup>1</sup>
- 15% of new AIDS cases were in people over the age of 50 in 2005<sup>1</sup>
- By 2015, half of PLWH in the U.S. will be >50 age<sup>2</sup>

<sup>1</sup>CDC, 2008 FactSheet  
<sup>2</sup>Effros et al.; Aging and infectious diseases: workshop on HIV infection and aging: what is known and future research directions. Clin Infect Dis 2008, 47:542-553



## Gaps

- Can the accelerated aging process in older adults living with HIV be slowed down?
- Can certain health behaviors impact the low grade chronic inflammation?
- How can we motivate older adults living with HIV to stay active and engaged?
- Can regular exercise prevent bone necrosis and osteoporosis in older adults with HIV?



## Exercise Benefits



- Cardiovascular function (↓ Blood Pressure)
- Metabolic function (↓ Blood Glucose)
- Pulmonary function (↓ Pulmonary Hypertension)
- Strength and muscle mass (↓ Muscle Atrophy)
- Prevention of Osteoporosis (↓ Bone Loss)



## Goal

To establish age-appropriate, evidence-based exercise interventions in HIV adults >50 years



## Methods

Compared exercise programs in 3 groups which represent burdensome clinical issues for PLWH

1. Older adults with frailty: *Loss of lean muscle mass*
2. HIV-Infected adults: *ART side effects*
3. Older adults with metabolic syndrome: *Metabolic changes in glucose and fat metabolism*



## Frailty Definition

A clinical syndrome in which 3 or more of the following criteria are present<sup>3</sup>:

Frailty Component	Description
Unintentional weight loss	>10-pound weight loss in previous year
Exhaustion	Self-reported exhaustion ≥3 days/week
Low physical activity levels	Men: <383 kcal/week Women: <270 kcal/week
Slowness	Walking time per 15 feet
Weakness	Based on grip strength

<sup>3</sup>Fried, et al., (2001). Frailty in older adults: Evidence for a phenotype. *Journals of Gerontology*, 56A, M146-M156



## Metabolic Syndrome

### ATP III\* Clinical Definition

Risk Factor	Defining Level
Abdominal Obesity	Waist circumference
Men	>102 cm (>40 in)
Women	>88 cm (>35 in)
Triglycerides	≥150 mg/dL
HDL Cholesterol	
Men	>40 mg/dL
Women	>50 mg/dL
Blood Pressure	≥130/85 mmHG
Fasting Glucose	≥110 mg/dL

\*Note: ATP III= 3<sup>rd</sup> report by Adult Treatment Panel from the National Cholesterol Education Program



## Total Exercise Studies Identified

### PubMed Search:

- Frail Older Adults: 322
- HIV-infected Adults: 664
- Older Adults with Metabolic Syndrome: 698



## Review Inclusion Criteria

- **Frail Older Adults (4 studies):**
  - >65 years
  - Aerobic/resistance exercise conducted
  - Cardiopulmonary and/or strength measurements
  - Weekly program followed for at least 6 weeks
- **HIV-Infected Adults (12 studies):**
  - >18 years
  - Aerobic/resistance conducted
  - Cardiopulmonary and/or strength measurements
  - Weekly program followed for at least 6 weeks



## Inclusion Criteria

- **Older Adults with Metabolic Syndrome (4 studies):**
  - >55 years
  - Aerobic/resistance exercise conducted
  - Cardiopulmonary and/or strength measurements
  - Weekly program followed for at least 6 weeks
- 17 studies in this review were randomized, controlled trials; 2 were non-randomized, controlled trials; 1 was single group cohort



## Forms and Outcomes of Aerobic Exercise

### Aerobic Exercise

Walking, running, swimming, bicycling, stair-stepper

### Outcomes measured

- Maximum O<sub>2</sub> consumption= VO<sub>2</sub> Max: maximal capacity for oxygen consumption by the body during maximal exertion



## Forms and Outcomes of Resistance Exercise

### Resistance Exercise

Weight training, weight bearing, calisthenics

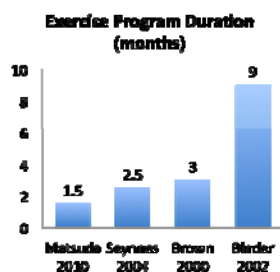
### Outcomes Measured

- One-repetition maximum: maximum amount of weight that can be lifted at any one time during a lifting exercise
- Maximum heart rate: highest heart rate that can be achieved without exercise stress; age-dependent

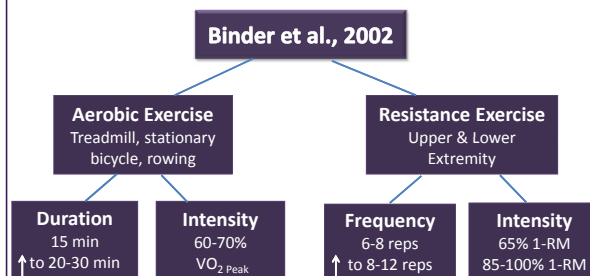


## Exercise & Frailty

- All studies showed significant improvement in muscle groups with  $p \leq 0.05$
- Mean age: 62 to 87 yrs
- Exercise intensity:
  - 30-40% of VO<sub>2max</sub> for low-intensity
  - 70-90% of VO<sub>2max</sub> for high-intensity

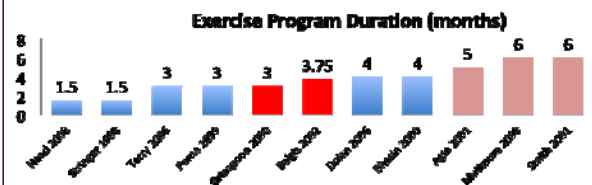


## Example: Older Adults with Frailty



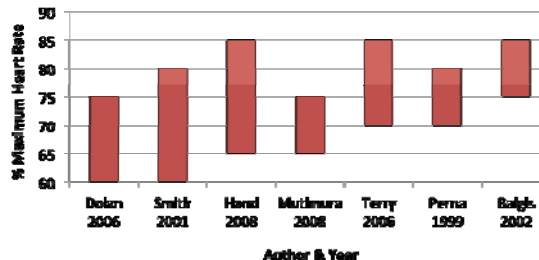
### Exercise & Adults Living with HIV

- Most studies show significant improvements in VO<sub>2</sub>max with sufficient aerobic exercise compared to sedentary controls.
- Mean Age: 36-47 yrs



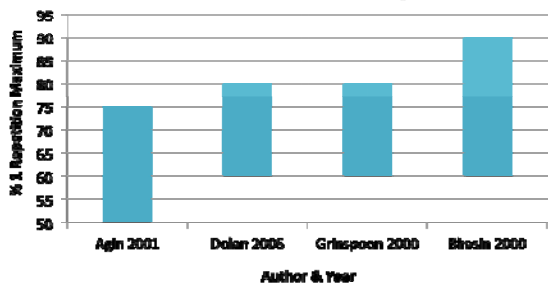
### Adults Living with HIV

**Aerobic Exercise: Intensity**



### Adults Living with HIV

**Resistance Exercise: Intensity**



### Example: Adults Living with HIV

**AEROBIC EXERCISE PROGRAMS**

SIGNIFICANT IMPROVEMENT			
Year & Author	Study Duration	Aerobic Exercise Intervention	VO <sub>2</sub> max Outcomes
Mutimura et al., 2008	6 mo	30 min pre/post 45 min jogging, running, stair-climbing	Exercise: 4.7 ml/kg/min ↑ Control: 0.5 ml/kg/min ↑ (p<.0001)
Dolan et al., 2006	4 mo	20 min run (first 2 wks) 30 min run (thereafter)	Exercise: 1.5 ml/kg/min ↑ Control: -2.5 ml/kg/min ↓ (p<.001)
NO SIGNIFICANT IMPROVEMENT			
Balgis et al., 2002	15 wks	25 min ski machine	Exercise: 0.3 ml/kg/min ↑ Control: -1.2 ml/kg/min ↓ (p=.90)
Smith et al., 2001	6 mo	20 min walking/jogging 30 min cycle, stairstep, cross-country machine	Exercise: 2.6 ml/kg/min ↑ Control: 1 ml/kg/min ↑ (p=.09)



### Why No Improvement?

1. Minimal exercise prescription of 20 minutes
2. Lack of progressive exercise
3. Missed sessions
4. Short length of intervention (Baigis et al.)
5. Participants generally more fit at baseline
6. Disproportionate loss of subjects from exercise group (Smith et al.)



### Example: Adults Living with HIV

RESISTANCE EXERCISE PROGRAM

Year & Author	Resistance Exercise Intervention	Repetition/ Duration	Outcomes		
			Intervention	Exercise Group	Control Group
Dolan et al., 2006	Knee extension, bench press, knee flexors, shoulder abduction, arm curls, calf raises	3 sets of 10 (2 wks) 4 sets of 8 (thereafter)  4 months	<b>Strength Measure</b>	<b>Change at 16 wks</b>	<b>Change at 16 wks</b>
			Knee extensors	33.2 ± 4.4	0.8 ± 1.5
			Pectoralis	13.9 ± 1.2	0.4 ± 0.7
			Knee flexors	8.4 ± 1.0	-0.3 ± 0.5
			Shoulder abductors	2.4 ± 0.3	0.3 ± 0.1
			Ankle plantar flexors	31.5 ± 4.0	1.9 ± 1.2
			Elbow flexors, right arm	3.5 ± 0.6	0.5 ± 0.4
Elbow flexors, left arm	3.6 ± 0.6	0.9 ± 0.3			



### Exercise & Metabolic Syndrome

- All studies in the review found aerobic and resistance exercise to be beneficial in improving metabolic outcomes in the elderly.
- Average age range: 56 to 73 years
- 1-Repetition Maximum range: 50%-80%

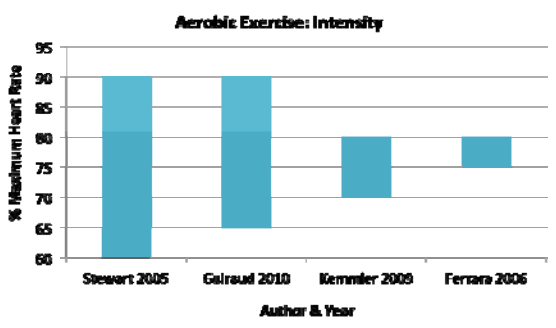


### Example: Older Adults & Metabolic Syndrome

Year & Author	Study Duration	Exercise Intervention	HRmax 1-RM	Outcome
Ferrara et al., 2006	3 x wk 6 mo	<b>Aerobic:</b> 45-60 min treadmill, running	75-80%	VO2max imp. by 16% from baseline in aerobic group (p<.01)
		<b>Resistance:</b> 8-12 reps of upper and lower extremity	80%	Leg and arm muscle strength increased by 45 ± 5% and 27 ± 5% after exercise (p<.0001)



### RESULT: Metabolic Syndrome



### Evidence-Based Recommendations: How Did We Arrive?

- We summarized findings from the 3 groups studied
- Took into consideration recommendations from the American College of Sports Medicine
- Consulted with a physical therapist



### Summary of Recommendations

AEROBIC EXERCISE				
	Exercise	Frequency	Duration	Intensity
<b>Frail Older Adults</b>	Walking, treadmill, cycling, rowing, swimming	3-5 days/wk	5-60 min, as tolerated	50-60% VO <sub>2</sub> max initially 85-90% VO <sub>2</sub> max gradual increase
<b>HIV-Infected Adults</b>	Treadmill, jogging, cycling, stair-climbing	3 days/wk	10-15 min warm-up/cool-down 20-45 min exercise	50-85% HR <sub>max</sub>
<b>Older Adults w/ Metabolic Syndrome</b>	Treadmill, stationary cycle, stair stepper	3-5 days/wk	45 min endurance	60-90% HR <sub>max</sub>



### Summary of Recommendations

RESISTANCE EXERCISE				
	Exercise	Frequency	Repetitions	Intensity
<b>Frail Older Adults</b>	Free weights, weight machines, isokinetic machines, ball machines	3 days/wk	15-20 min session	40% of 1-RM initially Gradual Increase to 85-100% * Start program without weight and slowly add
<b>HIV-Infected Adults</b>	Bench press, leg extension, leg curl, shoulder press/abduction, bicep/tricep curls	2-3 days/wk	3 sets of 10 initially, increase to 4 sets of 4-8 reps	60-80% 1-RM
<b>Older Adults w/ Metabolic Syndrome</b>	Treadmill, stationary cycle, stair stepper	3-5 days/wk	2 sets of 10-15 reps	50% 1-RM



### Exercise Program for Older Adults with HIV: Our Aerobic Recommendations

#### Exercise

- Walking, cycling, swimming, stair climbing, rowing (may use machines such as treadmill, and stationary bicycle).

#### Frequency/ Duration

- At least 3 days per week for 20-40 minutes.
- 5-10 minutes of stretching before and after each session to prevent injury



### Exercise Program for Older Adults with HIV: Our Aerobic Recommendations

#### Duration

- Should last at least 6 weeks

#### Intensity

- 50%-90% of estimated maximum heart rate
  - Based on age and weight of individual
  - Begin at lower intensity and incrementally increase



### Exercise Program for Older Adults with HIV: Our Resistance Recommendations

#### Frequency/Intensity

- 1-2 sets of 6-8 repetitions at 60% 1-RM initially
- ↑ to 3 sets of 8-10 repetitions at 80-90% of 1-RM
  - 20-30 seconds rest period between each set

#### 1-RM Intensity Scale:

- 1lb= 10% of 1-RM
- 10lb= 100% of 1-RM

#### Duration

- 3 days per week for at least 6 weeks



### Clinical Considerations

- Health care provider should establish baseline pulmonary and cardiovascular health measures prior to initiating new exercise program
- Previous exercise history of the patient, current medications, stage of disease, co-morbidities, and assessment of functional capacity
- Exercise had no measurable impact on immunological markers (CD4 count, viral load); safe at every level of HIV disease progression and age group
- Avoid prolonged strenuous physical activity for more than 90 minutes
- Training partner/group increases motivation and psychological well-being





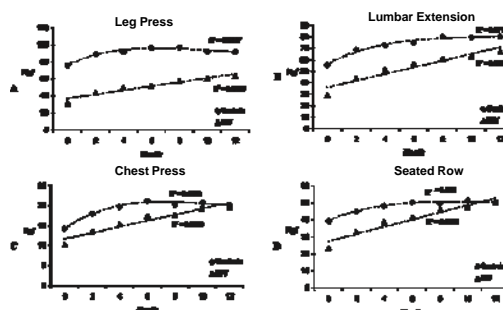
## New Research/Findings

- De Souza & Colleagues, 2011:  
Effect of progressive resistance exercise on strength evolution of elderly patients living with HIV compared to healthy controls

Average Age		Resistance Training	Frequency/Duration	Intensity	Outcome
HIV	Control	5 muscle groups	2 x week 1 year	-2 sets of 12-8 & 10 reps at light, moderate and heavy resistance	Strength ↑ 1.52-2.33 x the baseline values for those living with HIV; 1.21-1.48 times for controls (p<0.01)
64	67				



## New Research/Findings



Pattern of muscular strength gain along the period of training for elderly people living with HIV and controls\*

\*Souza et al., 2011. Effect of progressive resistance exercise on strength evolution of elderly patients living with HIV compared to healthy controls. *Clinics (San Paulo)*, 66, 261-6.



## Future Research

- Future studies are warranted in order to determine dosing and effect of aerobic and resistance exercise in the aging HIV population
- Further studies are needed to study the effect of exercise on the psychosocial aspects in the aging HIV population
- Future studies are needed to study the physiological effects of aerobic and resistance exercise in the aging HIV population



## Conclusions

- Aerobic and resistance exercise training is safe and effective and significantly improves aerobic and resistance capacity in older adults with HIV.
- Aerobic and resistance exercises should be performed at a moderate or vigorous level for at least 3 days a week.
- A gradual approach to increase physical activity in HIV-infected older adults minimizes the risk of injury and increases confidence in a participant's abilities.



Thank You!

Ellen McGough  
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QUESTIONS?

