

Exercise Intensity in Cardiac Rehabilitation: The Clinical Side of the Coin

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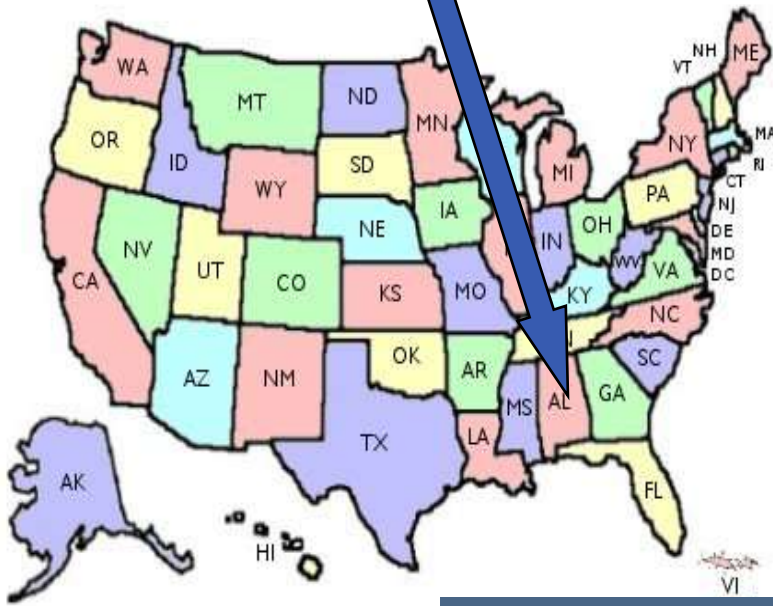
Overview

- Greetings from USA & AACVPR!
- Exercise prescription
 - Clinical application in patients with cardiac disease
 - Current recommendations: focus on intensity
- Patient outcomes related to exercise within cardiac rehabilitation settings
- Future considerations

Disclosures: NONE

Auburn University

Alabama



What is AACVPR?

**National professional association
of multidisciplinary health
professionals dedicated to the
care of cardiac and pulmonary
rehabilitation patients.**

***“Save lives by helping to heal
hearts, lungs, and people”***

**American Association of Cardiovascular
and Pulmonary Rehabilitation**

AACVPR Vision

Rehabilitation and preventive services for all patients with cardiac and/or pulmonary disease.

AACVPR Mission

To reduce morbidity, mortality, and disability from cardiovascular and pulmonary diseases through education, prevention, rehabilitation, research, and disease management.

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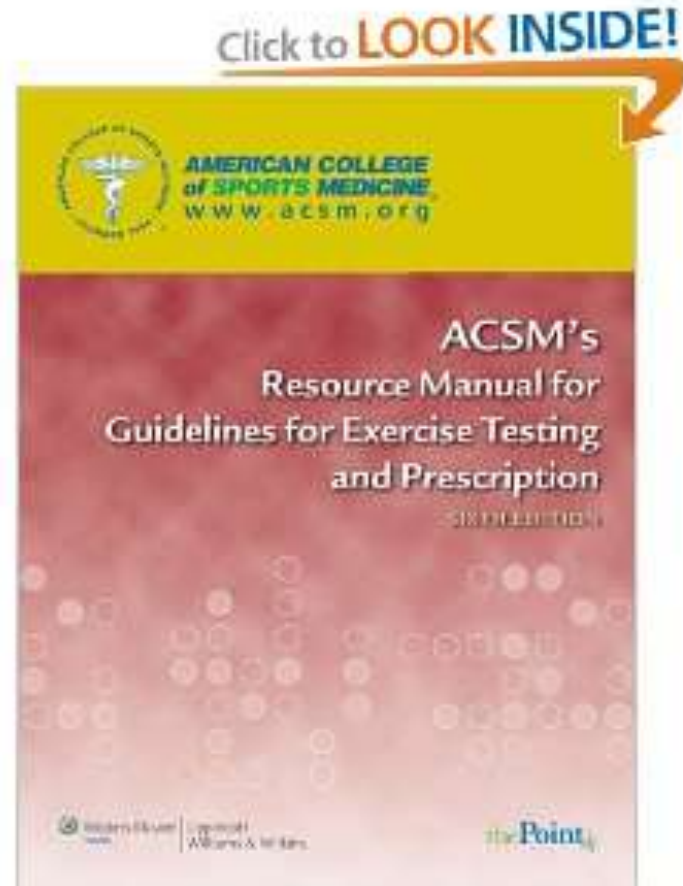
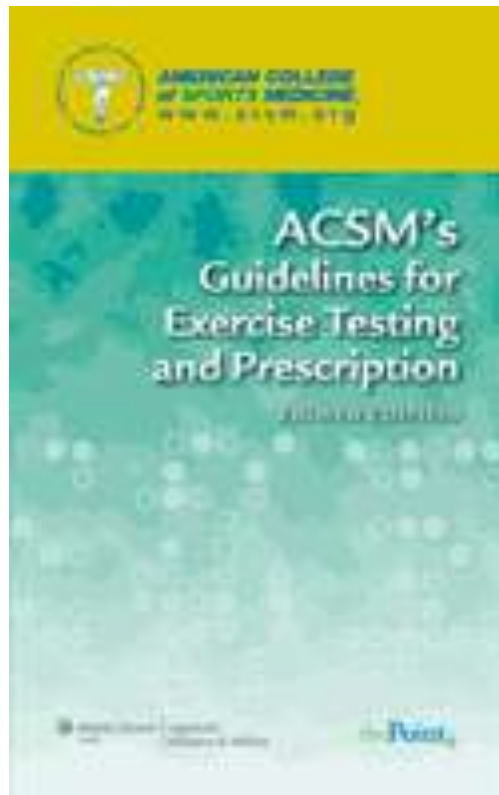
Exercise Prescription Goals

Health Related Physical Fitness Components

- Cardiovascular endurance – ability to sustain aerobic physical activity.
- Body composition – muscle, fat, bone.
- Muscle strength – ability to exert force.
- Muscle endurance – perform without fatigue.
- Flexibility – Range of motion ability

ACSM's Guidelines for Exercise Testing and Prescription, 8th Edition, 2010

Guidelines for Exercise Testing and Prescription



American College of Sports Medicine (ACSM) 2010
Lippincott Williams & Wilkins www.acsm.org

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Health Related Physical Fitness Components

Exercise Prescription

Components of and exercise prescription

FITT

- Frequency *(Who often?)*
- Intensity *(How hard?)*
- Time *(How long?)*
- Type *(What type?)*

Cardiovascular

1. Safety
2. Fitness
3. Risk factor management



Targets three goals in cardiac rehabilitation

Prescribing Safe Exercise

- Clinical status
- Risk stratification
- Results of exercise test – exercise capacity
- Medications
- Comorbidities; psychosocial issues
- Musculoskeletal integrity
- History of physical activity; vocational
- Age, gender

Realistic Goals- Individualized

Frequency

Training effect

Recommend exercising 4 to 7 days per week to facilitate CR fitness and body composition.

Goal:

- Increase days per week of physically activity and/or engage in regular exercise.
- Supervised PLUS home exercise routine

ACSM's Guidelines for Exercise Testing and Prescription, 8th Edition, 2010

- Warm up and cool down 5-10 minutes
 - <40% HRR, 9-11 RPE
- 20 to 60 minutes
- Continuous or intermittent aerobic activity
- Duration varies inversely to intensity

ACSM's Guidelines for Exercise Testing and Prescription, 8th Edition, 2010

Intensity

Training effect

Methods of prescribing and monitoring exercise intensity

- Workload – MET level
- Rate of perceived exertion (RPE)
- Heart rate (HR)

American College of Sports Medicine (ACSM) (2010)

Intensity

MET- Metabolic Equivalent

**Physiological – energy cost of
physical activities (work load)**

Resting: 1 MET = 3.5 ml O₂·kg⁻¹·min⁻¹

**Incremental intensity of activity-
multiple of resting MET level**

Prescribing & monitoring exercise intensity

MET Values

Activity	MET Value
Computer work	1.5
Making a bed	1.5
Walking slowly (30 min mile)	2-2.5
Cleaning windows	3.0-3.5
Walking moderate (20 min mile)	3.0
Golf (pulling clubs)	4.3
Walking briskly (15 min mile)	5
Mowing lawn (push mower)	5.5
Fast walk, jog	6.3
Shoveling sand, coal	7.0
Tennis, single; Running	8.0
Swimming – moderate to hard	8-11

Examples of MET Levels By Occupation

Occupation	METs
Fire-fighter (general)	12.0
Carrying moderate loads up stairs (16-40 pounds)	8.0
Farming, bailing hay, cleaning barn, poultry work	8.0
Shoveling (light; < 10 pounds/min)	6.0
Road building (driving heavy equipment)	6.0
Machine tooling (punch press)	5.0
General carpentry	3.5

Rating of Perceived Exertion

6	
7	Very Very Light
8	
9	Very Light
10	
11	Fairly Light
12	
13	Somewhat Hard
14	
15	Hard
16	
17	Very Hard
18	
19	Very Very Hard
20	

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THR Methods

Training heart rate (THR) methods

- Percent of heart rate max (HR max)
- Percent of Heart Rate Reserve (HRR)



HRmax

- Oldest method of THR – simple to compute
 - Uses fix percentage of HRmax
- 70-85% optimal intensity for exercise training
 - Symptom-limited GXT = max HR x .70 to .85 = 70- 85% THR
 - No GXT available- 220-age is rough estimate in healthy population
- Lower THR may be more appropriate for less fit – 50-70%.
- Gellish, RL (2007) $HR_{max} = 206.9 - (.67 \times \text{age})$

Heart Rate Reserve

Requires reliable resting HR
(standing)

Example

Pt. achieved 6 METs during GXT

- Estimated $\dot{V}O_2$: 21ml O_2 /kg/min
- Max HR 140
- Resting HR 70

$THR = (HR_{max} - HR_{rest}) \times .40 \text{ to } .80 + HR_{rest}$

Answer: 40% -80% THR = 98-126

Training effect

- Needs to be above minimal levels in whatever method calculated; yet below the metabolic load that evokes abnormal clinical signs/symptoms
- Myocardial ischemia; arrhythmias
 - >10-15 beats/min below ischemic ECG changes or angina symptoms

Intensity

Training effect

No maximal exercise test available

- Sub-maximal functional capacity
 - 6-min walk; other sub-max protocols
 - Estimate of baseline level of training
 - Conservative estimate – 20+ RHR
- Gradually titrate to higher levels according to RPE, clinical signs/symptoms
 - Initial MET level – 2-4 with 1-2 incremental increase, based on response
 - RPE: 11-14
- Continuous or intermittent (interval) training

American College of Sports Medicine (ACSM) (2007)

Training Approach

Training effect

The *minimum* level of intensity needed to increase cardiorespiratory fitness is well established

Increasing evidence

- higher vs. lower intensities result in greater increase in VO_{2max}
- Interval training – bouts of high intensity (90-100% HRR) interspersed with “rest” (minimal threshold) for equal time periods

Interval Training

Training effect

Current recommendations

- Vigorous intensity bouts
 - Patients must be medically stable
 - Physician clearance needed
 - Moderate intensity training well established (2-3 months) without problems
 - Used intermittently as an adjunct to moderate intensity training

Interval Training

Interval training (IT) for patients with CAD: a systematic review

- Significant and clinically important physiological adaptations in cardiac pts
- Improve VO₂ max, endothelial function, LV morphology & function- compared to conventional training
- No adverse, life-threatening events

Caution: methodological limitations; further research is required to determine the risk/benefits of high-intensity IT protocols in

CR

Cornish, Broadent, Cheema (2011) Eur J Appl Physiol.

Individualize Exercise Prescription

Baseline assessment critical

Physiological

Clinical status; comorbidities

Functional status

Risk factor burden

Psycho-social

Personal goals/preferences

Readiness/willingness

Practical, feasible for long-term adherence



Training effect

Lifestyle physical activity

- *In addition* to supervised exercise sessions
- Gradually return to general activities
- Establish habitual physical activity pattern
 - Goal 4-7 days/week; 30-60 minutes
 - Yield a weekly energy expenditure >1500 kcal/week
 - Pedometers may facilitate adherence

American College of Sports Medicine (ACSM) (2010)



**“What fits your busy schedule better,
exercising one hour a day or being
dead 24 hours a day?”**

Are we too conservative?



Failure to Improve Cardiopulmonary Fitness in Cardiac Rehabilitation

Patrick D. Savage, MS, MaryEllen Antkowiak, MD, and Philip A. Ades, MD

Purpose: Identify characteristics of CR participants (n=385) who fail to improve fitness (VO_2)

Results: 21% failed to improve VO_2 – Non-improvers

Non-improvers exercised at a lower intensity, similar RPE

Positive correlates: Exercise training intensity, baseline handgrip strength

Negative correlates: Baseline VO_2 ; Comorbidity score; self-reported physical function, diabetes.

Conclusion: Alternative training protocols should be considered for patients with characteristics of “non-improvers”.

Are we too conservative?

Exercise Physiology

High-Calorie-Expenditure Exercise

A New Approach to Cardiac Rehabilitation for Overweight Coronary Patients

Philip A. Ades, MD; Patrick D. Savage, MS; Michael J. Toth, PhD; Jean Harvey-Berino, PhD, RD;
David J. Schneider, MD; Janice Y. Bunn, PhD; Marie C. Audelin, MD; Maryann Ludlow, RD

Purpose: RCT (n=74) Exercise protocol (high-caloric expenditure) to address risk factor burden – weight loss and other risk-factor changes

Results: 3000-3500 kcal/wk compared to standard CR exercise (~800/kcal wk) yielded:

- double the weight loss; greater waist size reduction & fat mass loss; reduced insulin resistance, TC/HDL ratio, & other components of metabolic syndrome.

Conclusion: High caloric expenditure (volume) promotes greater weight loss & more favorable cardio metabolic risk profiles than usual CR exercise protocols. .

Summary

Benefits of CR

- ▼ morbidity and mortality
- ▼ symptoms
- ▲ cardiac risk factors
- ▲ quality of life
- ▲ physical functioning
- ▲ exercise capacity



**Exercise
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a cornerstone
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Calling on all health care providers to assess and review every patient's physical activity program at every visit.



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- Pantaleo Giannuzzi, President
- Stephan Gielen, President Elect

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Reduction: Time to Update the
Rationale for Exercise?”*

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