Exercise Prescriptions for Cardiopulmonary Fitness
心肺適能運動處方

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References

- Norman KAV. Exercise and Wellness for Older Adults. 2nd ed. IL: Champaign; Human Kinetics; 2010.
Cardiopulmonary fitness

- Maximal oxygen consumption, peak oxygen consumption
- About 1% decline every year in healthy individuals

Aging on cardiopulmonary fitness

Changes in anatomical structures of cardiopulmonary systems

Changes in physiological functions of cardiopulmonary systems

Others
Purposes of exercise prescription

- Enhance physical fitness
- Promote health
- Ensure safety during participation

Principles of planning an exercise

- Readiness (準備原則)
- Specificity (特殊化原則)
- Overload (超載原則)
- Progression (漸進性原則)
- Individualization (個人化原則)
- Balance (平衡原則)
- Regularity (規律原則)
- Diminishing returns
- Disuse regression (reversibility)
Steps of planning an exercise

Physical activity readiness questionnaire (PAR-Q)

Physical fitness assessment

Developing an exercise program

Exercise habit

PAR-Q & YOU

PAR-Q is designed to help you help yourself. Many health benefits are associated with regular exercise, and the completion of PAR-Q is a sensible first step to take if you are planning to increase the amount of physical activity in your life.

For most people, physical activity should not pose any problem or hazard. PAR-Q has been designed to identify the small number of adults for whom physical activity might be inappropriate or those who should have medical advice concerning the type of activity most suitable for them.

Common sense is your best guide in answering these few questions. Please read these carefully and check the YES or NO opposite the question if it applies to you.

Yes | No
---|---
1. Has a doctor ever said that you have a heart condition and recommended only medically supervised activity?
2. Do you have chest pain brought on by physical activity?
3. Have you developed chest pain in the past month?
4. Do you tend to lose consciousness or fall over as a result of dizziness?
5. Do you have a bone or joint problem that could be aggravated by the proposed physical activity?
6. Has a doctor ever recommended medication for your blood pressure or heart condition?
7. Are you aware through your own experience, or a doctor’s advice, of any other physical reason against your exercising without medical supervision?

If you have not recently done so, consult with your personal physician by telephone or in person BEFORE increasing your physical activity and/or taking a fitness test. Tell your physician what questions you answered YES on PAR-Q, or show him or her the copy.

If you answered PAR-Q accurately, you have reasonable assurance of your present suitability for:

- RESTRICTED PHYSICAL ACTIVITY, probably on a gradually increasing basis.
- UNRESTRICTED PHYSICAL ACTIVITY in some programs.
- RESTRICTED OR SUPERVISED ACTIVITY to meet your specific needs, at least on an infrequent basis.

After medical evaluation, seek advice from your physician as to your suitability for:

- RESTRICTED PHYSICAL ACTIVITY.

- UNRESTRICTED PHYSICAL ACTIVITY, probably on a gradually increasing basis.

- RESTRICTED OR SUPERVISED ACTIVITY to meet your specific needs, at least on an infrequent basis.

Check in your community for special programs or services.

If you have a temporary minor illness, such as a common cold...

If you answered PAR-Q accurately, you have reasonable assurance of your present suitability for:

- A GRADUATED EXERCISE PROGRAM—A gradual increase in proper exercise promotes good fitness development while minimizing or eliminating discomfort.

- AN EXERCISE TEST—Simple tests of fitness (such as the Canadian Home Fitness Test) may or may not be appropriate or necessary. Consult your physician for advice before deciding on further fitness testing.

If you have a temporary minor illness, such as a common cold...

ACSM, 2006
Key Elements of exercise prescription

- Mode (運動型式)
- Intensity (運動強度)
- Frequency (運動頻率)
- Duration (運動時間)

有氧運動 (1)

- 運動型式
  - 全身大肌肉群、長時間、節律性、有氧型態運動
- 頻率: 每週三天以上
- 運動時間: 每次持續20-60分鐘
- 運動強度: 50-85% VO$_{2\text{max}}$; 60-90% HR$_{\text{max}}$
有氧運動 (2)

暖身運動 (Warm-up)
- 5-10分鍾
- 目的: 提昇心跳及血流至運動肢體; 避免運動傷害

主要運動 (Conditioned exercise)
- 20-30分鍾以上

冷卻運動 (Cool-down)
- 5-10分鍾
- 目的: 促進靜脈回流

有氧運動 (3)

Table 5.2  Comparison of Methods for Prescribing Exercise Intensity for Healthy Adults*

<table>
<thead>
<tr>
<th>Classification</th>
<th>% VO₂R or %HRR</th>
<th>%HRmax</th>
<th>RPE (6-20 scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very light</td>
<td>&lt;20</td>
<td>&lt;35</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Light</td>
<td>20-39</td>
<td>35-54</td>
<td>10-11</td>
</tr>
<tr>
<td>Moderate</td>
<td>40-59</td>
<td>55-69</td>
<td>12-13</td>
</tr>
<tr>
<td>Hard</td>
<td>60-84</td>
<td>70-89</td>
<td>14-16</td>
</tr>
<tr>
<td>Very hard</td>
<td>≥85</td>
<td>≥90</td>
<td>17-19</td>
</tr>
<tr>
<td>Maximal</td>
<td>100</td>
<td>100</td>
<td>20</td>
</tr>
</tbody>
</table>

*Based on data from Pollock et al. 1998.
HRR = heart rate reserve; RPE = rating of perceived exertion.
Importance of combining other types of exercise

- Strength exercise
- Balance exercise
- Flexibility exercise
Barriers to exercise in the elder

- Mindset
- Multiple comorbidities
- Failure of physician referral

Exercise guidelines

<table>
<thead>
<tr>
<th>Level of function</th>
<th>Needs</th>
<th>Recommended activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physically dependent: cannot perform the BADLs but can perform some or all of the IADLs</td>
<td>Strength, range of motion, balance, and coordination necessary for basic self-care (BADLs): • Self-feeding • Bathing • Dressing • Transferring • Walking ROM and strength in the hips, knees, legs, ankles, shoulders, arms, wrists, and hands</td>
<td>• Chair and chair-assisted exercise addressing the BADLs • One-on-one strength and power training • Function-based exercise for upper and lower body • Seated coordination activities • Seated speed of movement activities with special focus on ankle, hand, and finger strength and mobility • One-on-one balance training • One-on-one gait training • Physical and occupational therapy • Seated recreational activities • Breathing and relaxation • Seated balance, standing balance</td>
</tr>
<tr>
<td>Physically frail: can perform the BADLs but cannot perform some or all of the activities necessary to live independently</td>
<td>Muscular strength, power, and endurance; low-level cardiovascular endurance; ROM; balance; coordination necessary to perform BADLs and IADLs (e.g., meal preparation, shopping)</td>
<td>Any of the exercises listed above plus the following: • Group water-based programming (e.g., water walking) • Modified tai chi and yoga • Supervised group strength and power training • Modified recreational games • Seated dance activities • Chair exercise with 9-minute segments of aerobic endurance • Walking</td>
</tr>
<tr>
<td>Physically independent: has unnoticeable, usual without debilitating symptoms of major chronic diseases</td>
<td>Muscular strength, endurance, and flexibility; joint ROM; balance; coordination; and cardiovascular endurance exercises to remain physically independent and prevent falls, disability, and injury</td>
<td>Any of the activities listed above plus the following: • Chair aerobics • Low-impact aerobics • Line, ball, social dancing • Water aerobics • Lap swimming • Walking courses • Tai chi and yoga • Circuit training • Strength and power training • Recreational and sports activities</td>
</tr>
<tr>
<td>Physically fit: exercise at least twice a week for their health, enjoyment, and well-being</td>
<td>Muscular strength, power, and endurance; joint ROM; balance; coordination; agility; and cardiovascular endurance</td>
<td>All activities</td>
</tr>
<tr>
<td>Physically fit: exercise at least twice a week for their health, enjoyment, and well-being; have high health and fitness reserves</td>
<td>Information on injury prevention and recovery Variety of opportunities to maintain level of fitness Education on appropriate exercise intensity and injury prevention and treatment</td>
<td>All activities</td>
</tr>
</tbody>
</table>
Tips

- Longer warm-up and cool-down
- Start one body part moving before adding a second
- Keep class interesting
- Evaluate all movements in terms of potential risks
- Social aspects

<table>
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<tr>
<th>Level of function</th>
<th>Needs</th>
<th>Recommended activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physically elite: train almost daily</td>
<td>Programming for muscular strength, power, and endurance; flexibility and agility; and high levels of cardiovascular endurance</td>
<td>All activities</td>
</tr>
<tr>
<td></td>
<td>Injury prevention and recovery</td>
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<td></td>
<td>Activity-specific training to improve performance in a desired area</td>
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<td></td>
<td>Notes to instructor: Help these participants maintain their level of fitness and provide conditioning for improving performance in competition or in strenuous activities. Your primary role with physically elite adults is to be a facilitator.</td>
<td></td>
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</tbody>
</table>

BADLs = basic activities of daily living; ROM = range of motion; IADLs = independent activities of daily living.
Non-cardiac Benefits of Exercise Training in Older Adults

- Hypertension
- Dyslipidemia
- Emotions
- Cognition
- Quality of life

Summary

- Cardiopulmonary fitness is a key to successful aging.
- Appropriate exercise training can effectively improve cardiopulmonary fitness in the elder.
- A combination of different types of exercise is a preferable regimen.