Faculty of Sports and Exercise Medicine

Dámh Leigheas Spóirt agus Aclaíochta

The

Green Prescription

Exercise Prescription for Health

FSEM, RCPI and RCSI, April, 2013

Index to The Green Prescription

The Green Prescription Pad
Accompanying notes

Dean's message on physical activity and exercise 2013

There is a strong relationship between exercise and health. Physical activity is essential to good health and quality of life. Physical activity and exercise exerts a positive influence on muscular-skeletal, cardiovascular, respiratory, hormonal-immunological, hematological, neuro-sensory and gastrointestinal systems. Physical activity levels are declining in most developed countries and in all age categories.

Regular physical activity and sport, especially during childhood and adolescence, promotes proper growth and development, maintains health and counteracts negative risk factors such as cigarette smoking, obesity, type 2 diabetes, osteoporosis, hypertension, coronary heart disease and other ailments. Risk factor profiles for many ailments limiting the quality of life are beneficially affected by physical activity and exercise.

The Sports Medicine specialist and other parties involved in this work may have a substantial impact on all the above points raised including reduction of health care costs.

Sports medicine is a multidisciplinary clinical and academic speciality of medicine dealing with health promotion for the general population, by stimulating a physically active lifestyle and diagnosis, treatment, prevention and rehabilitation following injuries or illnesses from participation to physical activities, exercises and sport at all levels. Sports medicine is globally defined and recognised not solely for taking care of the sporting elite athletes.

It is mainly focused on:

1. Prevention of chronic diseases caused by sedentary lifestyle as a major area of increasing interest which can partially be served by expertise in sports medicine.
2. Pre-participation clinical screening and examination before exercise and competition as well as medical assistance to the athletes engaged in all sports.
3. The use of supplements, pharmacological agents, doping control and gender verification and its complex moral, legal and health-related difficulties.
4. Special medical issues associated with International sporting events of athletes, including disabled athletes, such as the effects of travel and acclimatization.
5. Research in basic science and extensive clinical undertaken in the sports medicine domains within a great variety of specialities.

The increased attention from media and significant financial and political interactions in international sports events creates an atmosphere where business and sports meet, not always for the benefit of involved athletes. Consequently, sports medicine can encompass an array of areas including internal medicine, exercise physiology, cardiology, orthopaedics and traumatology, physical and rehabilitation medicine etc.

Sports medicine is a multidisciplinary specialty, integrating teams with physicians, athletic trainers, physical therapists, coaches, sport scientists, nutritionists, psychologists, athletes and other related specialties. Besides his clinical expertise, the sports medicine specialist should be considered as head of the multidisciplinary sports medicine team, coordinating the direct planning of the athlete's health activities, related to his health.

Dr Joseph Cummiskey *MD, FFSEM, FRCPI, FACP, FFIMS, FRSA,*

Example of a Exercise as a health prescription

The prescription

DR Name and address date of prescription
Contact numbers

Rx Original prescription

1. Cardio-respiratory

	FITT	Minimal	average	top
•	Frequency/week	3	5	6
•	Intensity	light sweat	medium sweat	heavy
	METS	3.5	5-7	>7 sweating
		Assistance from gym instructor to attain goal		
•	Type	walk	light jog	heavy jog,
		Assistance from gym instructor for alternatives		run
•	Time	30 minutes	40 minutes	50 minutes
•	Warm –up	5 minutes	7 minutes	10 minutes
•	Cool down and flexibility	10 minutes	15 minutes	20 minutes

2. Strength
Circuit training in under gym instructor for heavy, medium and light wts.
Starting with light weights and high reps., progressing under gym instructor

Follow up in 3-6 weeks

Stop and reconsult your doctor sooner if new symptoms

Signature _____

Preamble

Goals

Develop a recommended exercise prescription for sports medicine physicians in Europe

Target group are healthy subjects without serious medical symptoms but with potential or existing CV, Pulmonary and Metabolic risk factors.

A second target group are those with known underlying health problems that need ongoing medical care with 2 or more drugs and usually attend an outpatient hospital department for a diagnosed chronic medical condition.

Introduction

Modifiable risk factors that benefit from exercise

- Hypertension
- High fat saturated diet
- Abnormal blood lipid levels (high total cholesterol, high levels of triglycerides, high levels of
- low-density lipoprotein or low levels of high-density lipoprotein (HDL) cholesterol).
- Tobacco use (smoking or chewing tobacco, especially if started at a young age or in females.
- Physical inactivity increases the risk of heart disease and stroke by 50%
- Obesity is a major risk for cardiovascular disease and predisposes to DM II.
- Type 2 diabetes, which doubles the risk of coronary heart disease and stroke.
- A chronically stressful life, social isolation, anxiety and depression increase the risk of heart disease and stroke.
- One or two units of alcohol may lead to a 30% reduction in heart disease, but more than this level of alcohol consumption may damage the heart.
- Medications may increase the risk of heart disease eg. contraceptive pill, hormone replacement therapy (HRT).
- Left ventricular hypertrophy (LVH).

Non-modifiable risk factors

Age, the risk of stroke doubles every decade after age 55.

Family's history, cardiovascular disease indicates your risk.

If a first-degree blood relative has had coronary heart disease or stroke before the age of 55 years (for a male relative) or 65 years (for a female relative) your risk increases.

Gender, males have a greater risk of heart disease than pre-menopausal woman.

Once females reach the menopause, the risk of cardiovascular disease is similar.

Men and women have the same risk of stroke.

Ethnicity, people with African or Asian ancestry are at higher risks of developing cardiovascular disease than other racial groups.

What we would like to see as a minimal

A scientific approach based on 50 years of modern European experience and 3 thousand years of ancient experience.

A benefits v. risk assessment on each participant

A measured external load followed up with Physiological adaptation to exercise

Other European groups and what they are doing

- ECSS only want to be involved in the research of exercise
- HEPA do not want anything to do with the medical illness part of exercise.
- EIM-E only requires a clinical and family history, non-illness group
- EFSMA wish to be involved in medical care of participants prescribed exercise at all ages with and without chronic illness.

The Exercise and its assessment

The measured external load

- The comparison of groups and the measure of exercise they are doing is important.
- The energy cost of an activity can be measured in units called METS, which are multiples of your basal metabolic rate. One MET is the metabolic rate when one is sitting quietly in a normal temperature room.
- An increase in METs is based on an increase of measured exercise like a step test, a cycle ergometer or a thread mill test. Another measured is done at the point of sport activity. There are advantages and disadvantages to each of these tests. (they are used to estimate the oxygen capacity compared to oxygen consumption).
-

The measured adaptation to exercise. (Exercise Physiology)

- Exercise Physiology is concerned with the study of how the body adapts physiologically to the acute stress of exercise, or physical activity, and the chronic stress of physical training.
- This science provided the basic knowledge and justification for the inclusion of exercise as an integral component of healthy life style and laid the foundation for the science of exercise prescription in both sickness and health.
- The understanding of exercise physiology and the prevention exercise can bring is an integral goal of our programme.

The 3 Major Variables of Performance

1. Maximal oxygen consumption is limited by central cardiovascular function, but also dependent on the peripheral adaptations that occur in the trained muscles.
2. A high lactate threshold is due to peripheral adaptations improving the muscle's ability to generate energy aerobically.
3. A high economy creates the link between the physiological engine and the actual performance goal, to maximize average velocity.

Psychology factors involved:

Physicians prescribing exercise should be familiar with behavioural stratigies to enhance exercise and health behaviour change (e.g. reinforcement, goal setting and social support).

Identification

Pre-contemplation Phase – the patient has not yet considered a lifestyle change.
Recommended action by the physician: educate the patient on the benefits to be achieved by initiating lifestyle changes.
Contemplation Phase – the patient thinks about commencing regular physical activity within the next 6 monthsà recommended action by physician : as per Exercise Guidelines Document
Preparation Phase – the patient is ready to start exercising regularly within the next 30 days à recommended action: as per Exercise Guidelines Document
Action Phase – the patient gets involved in regular physical activity for a period up to 6 months à recommended action: the physician offers advice, encouragement and as per Exercise Guidelines Document
Maintenance Phase – the patient is now involved in regular physical activity and has been doing so for more than 6 months à recommended action by the physician : advice, encouragement and as per Exercise Guidelines Document

Motivation

Competence
The feeling that the participants are sufficiently capable to affect a desired behavioural outcome. This may be experienced as a self-belief in the ability to exercise and to feel comfortable in exercise settings. Competence enhances the intrinsic motivation for the behaviour (i.e., being able to participate in physical activity).

Autonomy
- A sense of personal choice and an internal perceived locus of causality, and the ability to make decisions within the individual's control is important.
- This may be manifested in a belief that success arises from personal drive and effort or through the capacity to choose the type of physical activity to engage in.

Relatedness
This incorporates both contextual and psychological aspects, where individuals feel secure within certain contexts and environments, while also fulfilling their need to be connected to others

A Guideline to that Prescription

This should be a separate green prescription pad with the following as a 3 page information booklet at the back.

All prescriptions should have recommendations on
- Warm-up, Stretching,
- **CR endurance training**
- **Strength training**
- Cool-down
- Weight bearing, Flexibility exercises

Pre-participation examination (PPE), monitor, CPET?

	Preparticipation Examination	clinical monitor	physiol monitor
• Exercise for the well paediatric age group	yes	yes	no
• Exercise in the well geriatric population	yes	yes	no
• Exercise in the well young adults 18-35 y.o..	yes	yes	yes
• Exercise in the well younger middle aged adult 36-55 y.o.	yes	yes	optional
• Exercise in the well older middle aged adults 56-65 y.o..	yes	yes	optional

Original prescription should contain FITT

FITT	Minimal	average	top
Frequency /week	3	5	6
Intensity	light	medium	heavy sweating
Type	walk	light jog	heavy jog, run
Time / minutes	30	40	50

Assessment of exercise

	minimal	average	top
pre-participation examination	no	yes	yes
clinical monitoring of effects of exercise intervention	yes	yes	yes
physiological results of regular physical activity	no	no	yes
anthropometic measurements	y	y	y

Clinical monitoring

History

- Improved cardio-respiratory endurance
- Improved muscular endurance without symptoms
- Improved ability to do daily activities with fewer drugs

- Physical examination, walking, general appearance, independance
- The 5 vital signs: BP, HR, RR at rest + with exercise, Wt. + ht., hx of exercise
- Reduced total body fat, Reduced abdominal girth
- CV, resp., abdominal CNS, dermatological, ENT, LN, thyroid, hands, feet

The science of exercise must not be dumped down

CPET as a clinical laboratory test with cycle or thread mill is our gold standard

Others include

- Step test
- 6 minute walking test
- Borg tiredness scale

The need for or the quantity of drugs for cholesterol lowering, oral anti diabetics, anti-hypertensives tablets and anti-depressants, together with life style habits are monitored on a 6-12 week regime.

Appendices

Appendix 1 :
Tell the patient why exercise is good

Tell the patient

1. There are health-related benefits of regular physical activity that did not meet traditional criteria for improving fitness of exercise
2. Exercise might also be considered as a fifth vital sign and should be recorded in patients' electronic medical records and routine histories,
3. Simple things like walking instead of taking transit, and walking the dog make a big difference.
4. Patients ought to report how many minutes of physical activity they undertake in an average day and how many days a week such activity takes place. This measurement provides a score (in minutes per week) that can alert patients and clinicians to potential risks related to physical inactivity."
5. People who took up playing football two or three times a week experienced reduced risk factors for cardiovascular disease, diabetes and the brittle-bone disease osteoporosis.

Table: Exercise compared with drugs or surgery in non-communicable diseases

	Exercise benefit	Drug or surgical benefit
Cardiac disease	40% risk reduction[2]	24% risk reduction with statins[3]
Stable coronary Artery disease	88% survival at 12 months[4]	70% survival at 12 months with percutaneous coronary angioplasty[4]
Type 2 diabetes	58% incidence reduction[5]	31% incidence reduction with metformin[6]
Hip fracture	55% incidence reduction[7]	38% risk reduction with risedronate[8]
Breast cancer	40% risk reduction[9,10]	38% incidence and risk reduction with tamoxifen[11]
Recurrent breast cancer	54% reduction in mortality[12]	59% reduction in mortality with tamoxifen[13]
Major depression	Exercise as effective as sertraline (60·4% reduced rate) with a relapse rate of 30%	Sertraline as effective as exercise (65·5%remission) but with an increased relapse rate of 52%[14]

Studies chosen to show effectiveness of exercise, and benefits should not be regarded as directly comparable apart from percutaneous coronary angioplasty4 and major depression.14 Exercise can be expected to provide broader health benefits than individual drug or surgical interventions.

www.the lancet.com Vol 380 July 7, 2012

Appendix 2.
Preparticipation examination

The Sports Participation Examination for the healthy person
J.Cummiskey MD

- This can be self or physician administered
- The sports pre-participation examination is used to identify conditions that
- put the athlete at risk for injuries, illness and death.
- It can also be used to direct participants to an appropriate sport.
- It should be repeated every two years or more often if there is an injury or illness.
- Most disqualifying conditions are detected by the medical history.
-

Self administered PPE (valid for 12 months)
Physical Activity readiness-Questionaire (Canada).
PAR-Q

- Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
- Do you feel pain in your chest when you do physical activity?
- In the past month have you had chest pain when you were not doing physical activity?
- Do you loose your balance because of dizziness or do you ever loose consciousness?
- Do you have a bone or joint problem (back, knee, hip) that could be made worse by a change in your physical activity?
- Is your doctor currently prescribing drugs (e.g. water pills) for your BP or a heart condition?
- Do you know of any other reason why you should not do physical activity?

If YES to one or more questions see your doctor before exercise.
If NO to all questions only start exercise if you have no infection or may be pregnant.

There are 12 key questions in the physician supervised history:

1.	**RT**	Does the athlete have asthma (Wheezing), hay fever or coughing spells after exercise?
2.	**CVS**	has anyone in the athlete's family died suddenly before the age of 50 years
3.	**Dizzy**	Has the athlete ever passed out during exercise or stopped exercising because of dizziness?
4.	**CNS**	Does the athlete has a history of concussion (being knocked out)
5.	**GU**	Age of onset of menstruation and frequency.
6.		Do you see a physician regularly for any particular problem
7.	**Meds:**	Does the athlete take any medication?
8.	**Allergies**	Is the athlete allergic to any medication or bee stings
9.		Does the athlete have only one of any paired organ (eyes, ears, kidneys, testicles, and ovaries)?
10.		Has the athlete ever broken a bone, had to wear a cast, or had an injury to any joint?
11.		Does the athlete wish to discuss anything with the physician?

The 90 second orthopedic screening exam

Athletic Activity instruction	Observation
Stand facing examiner	General habitus,
AC joint	Look at ceiling, floor, over both shoulders, Cervical
spine motion	Touch ears to shoulders
Shrug shoulders	Trapezius strength
Abduct shoulders	Deltoid strength (Examiner resists at 90 to 90 degrees)
Full external rotation of arms	Shoulder motion
Flex and extend elbows	Elbow motion
Arms at side,	Elbows flexed at 90 degrees
	Elbow and Pronate and supinate wrists
Spread fingers; make fist	Hand or finger motion and deformities
Tighten quadriceps	Symmetry of thighs, knee or ankle effusion,
"Duck walk" four steps	Hip, knee and ankle motion away from examiner
	Buttocks on heels
Back to examiner	Shoulder symmetry, scoliosis
Knees straight, touch toes	Scoliosis, hip motion, hamstring tightness
Rise up on toes, raise heels	Calf symmetry, leg strength

Appendix 3.
The ECG interprepation and indication for cardiology consultation

Criteria for a positive 12-lead ECG
Refer for cardiology opinion

P wave

left atrial enlargement:

negative portion of the P wave in lead V1:

0.1 mV in depth

0.04 s in duration;

right atrial enlargement:

peaked P wave in leads II and III or

V1 : 0.25 mV in amplitude.

QRS complex

frontal plane axis deviation:

right : þ1208 or

left : 308 to –908;

increased voltage:

amplitude of R or S wave in a standard lead _2 mV,

S wave in lead V1 or

V2 _ 3 mV, or R wave in lead V5 or V6 _ 3 mV;

abnormal Q waves _0.04 s in duration or

25% of the height of the ensuing R wave or QS pattern in two or more leads;

right or left bundle branch block with QRS duration _0.12 s;

R or R0 wave in lead V1 _ 0.5 mV in amplitude and R/S ratio _1.

ST-segment, T-waves, and QT interval

ST-segment depression or T-wave flattening or inversion in two or more leads;

prolongation of heart rate corrected QT interval .0.44 s in males and . 0.46 s in females.

Rhythm and conduction abnormalities

premature ventricular beats or more severe ventricular arrhythmias;

supraventricular tachycardias, atrial flutter, or atrial fibrillation;

short PR interval (,0.12 s) with or without ‘delta’ wave;

sinus bradycardia with resting heart rate _40 beats/mina;

first (PR _ 0.21 sb), second or third degree atrioventricular block.

aIncreasing less than 100 beats/min during limited exercise test.

bNot shortening with hyperventilation or limited exercise test.

Modified from Corrado et al.3

Appendix 4.
Interpretation of exercise physiological test

Interpretation of Physiological Clinical Exercise Test

Joseph Cummiskey MD
From Wasserman, Whipp

Pulmonary parameters

1. **Pulmonary function test (Static PFT)** may give a diagnosis without an exercise test. A fall of lung function of greater than 20% after exercise is indicative of exercise induced bronchospasm. Asthma is the most likely diagnosis although transient inflammation of the airways may cause exercise induced bronchospasm.

   A fall in lung function of less than 15% post adequate exercise is against a diagnosis of EIB but a Methacholine challenge test may uncover hyperirritable airways and a diagnosis of asthma.

2. **Maximal oxygen uptake (VO2 max)** is a measure of the maximum amount of effort capable of performance by the patient. It is normally greater than 90% predicted.

> 110% predicted	represents athletic performance
> 90% predicted	normal or exercise limitation may be mild cardiac or pulmonary in origin
< 90% predicted	exercise limitation is moderate cardiac or pulmonary in origin. Deconditioning may also limit ability to reach VO2 max

3. **Ventilatory reserve (VR)**

   VR = (1 - (VE max / predicted MVV)) X 100%
   Predicted MVV = 41 X FEV-1 (predicted)

   At VO2 max the patient should have some ventilatory reserve
   Normal = 20-40% >15 L/min VE - MVV

>30%	no ventilatory mechanical limitation
<30%	a ventilatory mechanical limitation is present
	If RR > 50 breaths / min it is restrictive lung disease (RLD)
	If RR < 50 breaths / min it is an obstructive ventilatory abnormality

4. **Efficiency of the lung as a gas exchange unit.**

   This is a measure of the gas exchange limitation
   Measures the ability of lung ventilation to remove CO2
   VE max / VCO2
   Normal 25 – 35
   > 40 Excessive ventilation necessary to overcome the inability of the lung to remove CO2 due to a gas exchange problem. This is suggestive of pulmonary vascular disease not other circulatory abnormalities
   Anxiety is a possible cause for this abnormality due to an increased drive to ventilation at the beginning of exercise only.

5. Oxygen saturation Sa O2

< 4 % change is normal

> 4 % decrease is most commonly due to diffusion limitations.

Shunts and ventilation – perfusion mismatch are also a possibility

6. Oxygen pulse VO2 – cardiac frequency (fc)

Low Structural heart disease, pulmonary vascular disease and Anaemia.

Not chronotropic incompetence and peripheral vascular disease

Cardio – vascular parameters

1. **Heart rate response (HRR)** is a measure of the
(HR max – HR rest) / VO2 max – VO2 rest (L/min)

25 – 35	Trained athletes
35 – 45	Sedentary or untrained athlete
> 50	Cardiac pump abnormality due to cardiomyopathy or deconditioning of moderate degree

2. **ST segment changes** are a measure of cardiac ischaemia.

Highly positive	> 3 mm parallel to baseline decease at early exercise
Positive	1 -3 mm decrease at late exercise

3. **Ventilatory anaerobic threshold (VAT)** is expressed as the VO2 at which VE / VO2 ratio increases. It is a measure of exercise tolerance.
O2 consumption at VAT / VO2 max or predicted VO2 max

< 40	circulatory or pump limitation because an inability of the heart or circulation to provide the necessary oxygen for aerobic metabolism
55 – 60	Normal

Appendix 5

The prescription

All prescriptions should have recommendations on

- Warm-up,
- Stretching,
- Cool-down
- Weight bearing,
- Flexibility exercises
- Warm down

Original prescription

FITT	**Minimal**	**average**	**top**
Frequency/week	3	5	6
Intensity	light sweat	medium sweat	heavy sweating
Type	walk	light jog	heavy jog, run
Time	30 minutes	40 minutes	50 minutes

Assessment of exercise		**minimal**	**average**	**top**
1.	pre-participation examination	no	yes	yes
2.	clinical monitoring of effects of exercise intervention	yes	yes	yes
3.	physiological results of regular physical activity	no	no	yes

Clinical monitoring

History
Improved cardio-respiratory endurance
Improved muscular endurance without symptoms

Physical examination
BP, HR, RR at rest and with exercise, Weight, exercise hx
Reduced total body fat, Reduced abdominal girth

Laboratory tests
ECG and when a referral to a cardiologist is indicated (appendix 4.)
Physiological assessment

Physician supervised physiological exercise test is done with continuous monitoring of cardiac, pulmonary and metabolic parameters are needed. There is no simple set of guidelines for a physiological exercise test. The risk of CV events with exercise increase as a direct function of exercise intensity (vigorous > moderate > low exercise intensity)

Clinically it is used to decide the cause of dyspnea and limitation to exercise. It is used to note ECG changes of exercise that may reflect ischemia, cardiac arrhythmia, exercise induced asthma, hypoxemia of exercise and other parameters as listed in appendix 2.

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