Pre-exercise screening for cardiac rehabilitation

Associate Professor Andrew Maiorana, AEP

School of Physiotherapy and Exercise Science, Curtin University;

Department of Allied Health & Advanced Heart Failure and Cardiac Transplant Service, Fiona Stanley Hospital

Department of Health
GOVERNMENT OF WESTERN AUSTRALIA

FIONA STANLEY hospital

Curtin University

Exercise in the contemporary model of health

Setting	Elite sport	Pop^{n} health	Acute illness/injury	Chronic illness
Goal	Optimisation	Prevention	Rehabilitation	Management

The exercise paradox

- **Musculoskeletal injuries, cuts, abrasions, blisters, haematomas**
- **Falls**
- **Metabolic disorders**
- **Adverse acute cardiovascular responses**

- **Improved fitness**
- **Weight management**
- **Reduced falls risk**
- **Better metabolic control**
- **Improved quality of life**
- **Reduced long term risk of cardiovascular and other chronic diseases**

Evidence-based risk assessment

- The benefits of being physically active far outweigh the transiently increased risk of cardiovascular events seen during and immediately following acute bouts of PA or exercise (Level of evidence 1A).

Appl. Physiol. Nutr. Metab. 36: S266–S298 (2011)

Exercise prescription in cardiovascular disease: What are the risks?

Cardiac rehabilitation:

- One cardiac event for approx. 50 000 hours of exercise training and 1.3 cardiac arrests per million patient-hours *(Pavy et al. Arch Intern Med 2006;166:2329-34)*
- One case of ventricular fibrillation per 111 996 patient-hours of exercise and one myocardial infarction per 294 118 patient-hours. *(Van Camp SP, Peterson RA. JAMA1986; 256:1160-3)*

Heart failure

- "No evidence to suggest that exercise training programmes cause harm in terms of an increase in the risk of all cause death in either the short or longer term" in patients with stable chronic heart failure (NYHA I–III). (*Taylor RS, et al. Exercise-based rehabilitation for heart failure. Cochrane Database Syst Rev 2014)*
- "To date there exist 123, 479 patient-hours of exercise conducted in research studies, and not a single death while a patient was exercising…" *(Ismail et al JACC HF 2013;1; 514-22).*

Pre-exercise screening

- Should be applied to all individuals prior to exercise prescription
- Review exercise participation, medical history, assess physical/physiological responses

Outcomes:

- identify contraindications to exercise
- risk stratification (historically)
- informed exercise prescription

Contraindications to Exercise

Absolute

- Recent significant change in the resting ECG
- Unstable angina
- Uncontrolled symptomatic dysrhythmias
- Symptomatic severe aortic stenosis
- Uncontrolled symptomatic heart failure
- Acute pulmonary embolus
- Acute myocarditis or pericarditis
- Suspected or known dissecting anaeurysm
- Acute systematic infection

Contraindications to Exercise

Relative

- Left main stenosis
- Moderate stenotic valvular disease
- Electrolyte abnormalities
- Severe resting arterial hypertension (>200/110mmHg)
- Tachy or bradyarrhythmias
- Hypertrophic cardiomyopathy, with outflow tract obstruction
- Neuromotor, musculoskeletal, rheumatoid disorders exacerbated by exercise
- High-degree AV block
- Uncontrolled metabolic disease
- Mental or physical impaired leading to inability to exercise adequately

***Can be superseded if benefits outweigh the risks of exercise.**
May be exercised with caution if asymptomatic at rest

AACVPR Stratification Algorithm for Risk of Event (2012)

Low Risk :

- Ejection fraction > 50%
- No resting or exercise-induced complex dysrhythmias
- Uncomplicated MI, CABG, angioplasty, atherectomy, or stent
- Absence of CHF or signs/symptoms indicating post-event ischemia
- Asymptomatic with exercise or in recovery, including absence of angina, aerobic capacity at least 7.0 METs

AACVPR Stratification Algorithm for Risk of Event (2012)

Moderate Risk:

- Left ventricular ejection fraction = 40–50%
- Signs/symptoms including angina at “moderate” levels of exercise (60–75% of maximal capacity)
- Mild to moderate silent ischemia (ST depression less than 2mm) with exercise or in recovery

AACVPR Stratification Algorithm for Risk of Event (2012)

High Risk:

- Ejection fraction < 40%
- Survivor of cardiac arrest or sudden death
- Complex dysrhythmias, MI or cardiac surgery complicated by cardiogenic shock, CHF, post-procedure ischemia
- Abnormal haemodynamics with exercise, significant silent ischemia with exercise or in recovery
- Aerobic capacity or signs/symptoms at low levels of exercise (< 5.0 METs)

What defines a ‘complex’ patient

- Cardiovascular pathology (coronary artery stenoses, cardiac function, arrhythmias)
- Low exercise capacity/tolerance
- Recent surgery and other medical interventions
- Medication (especially newly prescribed, during titration)
- Device therapies (pacemakers, ICDs, left ventricular assist devices)
- Prior exercise history (…. or lack of)
- Co-morbidities
- Age
- Psychological/behavioural factors
- Language other than English
- Ethnicity (cultural considerations)

No risk stratification algorithm considers all these factors!

Exercise for patients with chronic cardiovascular disease

- Not all patients are exercising in the setting of “rehabilitation”
- A persons level of complexity can change over time
- People may commence/return to exercise some time after a cardiovascular event (in primary care)
- Who is best qualified to provide an assessment and exercise prescription in this context?

Clinical exercise professionals

- Clinical exercise physiologists (Accredited Exercise Physiologists) and Physiotherapists are accredited to provide clinical exercise services as an integral part Medicare.
- Receive education and training, including practicum placements, in clinical exercise prescription
- Considered independent health practitioners, who are competent to take responsibility for decisions about exercise prescription using both evidence and clinical reasoning. **This removes the need for physicians to 'clear' their patients prior to being referred for exercise.**
- Instead, bi-directional referral pathways between physicians and exercise professionals are encouraged.

A new model for guiding safe and effective exercise prescription in the community for patients with cardiovascular

- Complement existing processes i.e. (Adult Pre-exercise Screening System; APSS)
- Reflect the unique position of AEPs and Physiotherapists in Australia
- Focus on scope of practice commensurate with training and experience for different exercise professions
- More clearly articulate the role of medical practitioners consistent with their training and expertise - ‘guidance’ rather than ‘clearance’

Maiorana et al. Sports Med. 2018 Jun;48(6):1293-1302

Why a new model?

Historical approaches have been criticised for:

- creating a barrier to the uptake of exercise;
- restricting people from achieving optimal exercise;
- placing a burden on health care systems

- in the US >90% of the population >40 years are advised to consult a medical practitioner before commencing an exercise program based on the AHA/ACSM Pre-Participation Questionnaire (AAPQ)

Whitfield et al. *Circulation.* 2014;129:1113-1120

Exercise and cardiovascular risk in a community setting

Medicolegal experts have issued fresh warnings to GPs over ‘fit to exercise’ certificates, in response to the launch of a new form touted to ease liability fears. (Australian Doctor, 2012)

“How could a doctor possibly know whether or not a patient is fit to exercise? We don't know what their level of fitness is and we would have to spend many hours observing them in order to draw conclusions. We do not know what level of expertise the trainers at the gym possess nor even specifically what exercises the individual will be doing. What level of supervision is there? What testing of fitness level is done at this gym?” (QLD Doctor)

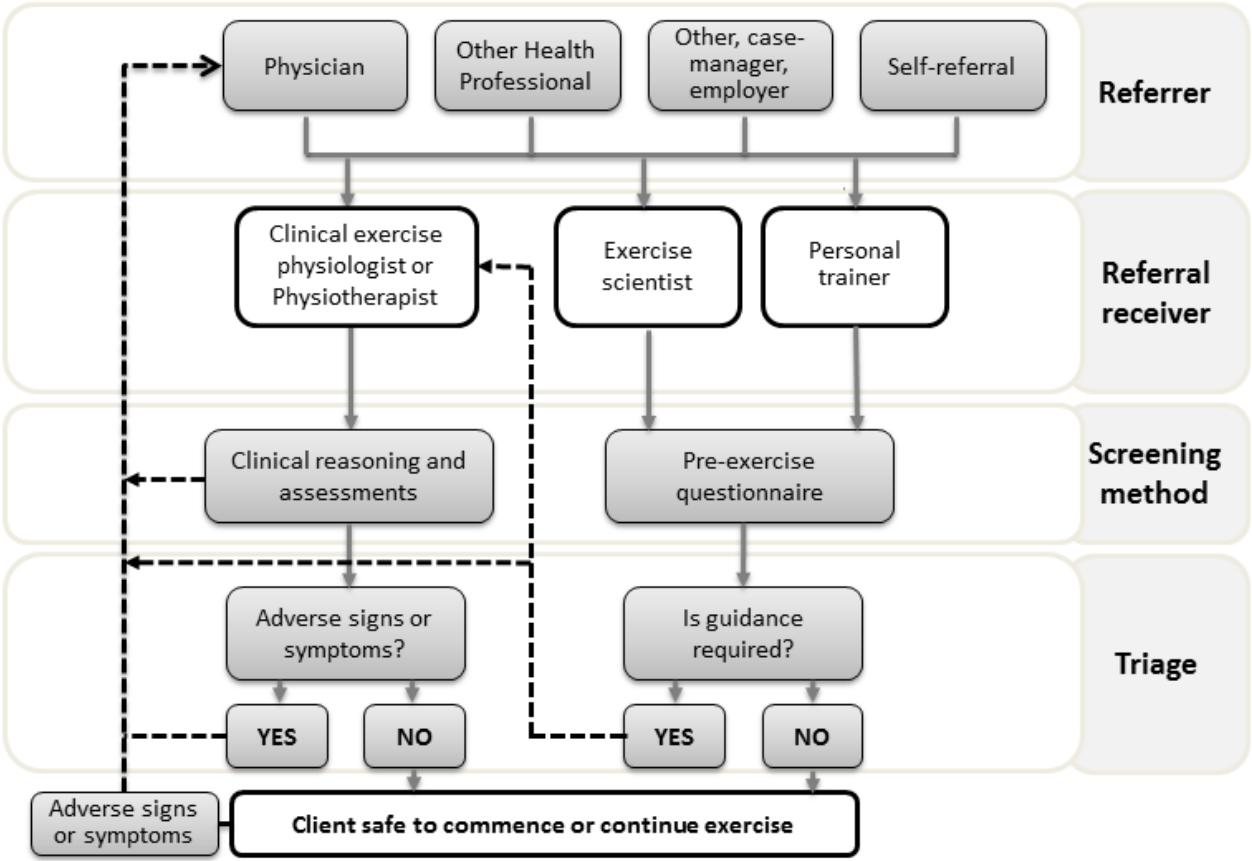
Exercise in medical education

Number of hours and the ranges of required physical activity training during medical school.

Year in medical school	Four year programs (n = 8)	Five year programs (n = 1)	Six year programs (n = 4)
1	3.6 (0–12)	1.0	2.0 (1–3)
2	2.0 (0–4)	1.0	1.3 (0–2)
3	0.8 (0–3)	1.0	3.3 (2–6)
4	0.3 (0–2)	1.0	1.8 (1–3)
5	–	1.0	2.5 (0–5)
6	–	–	1.5
Average	6.6	5.0	12.3

Strong et al. / Journal of Science and Medicine in Sport 20 (2017) 534–538

ESSA logic model for exercise referrals and screening



Tips for practice

1. Obtain as much information as possible about clients who are referred to you
   - If information is lacking, seek clarification

2. Use clinical history, interview and physical assessment to guide decision making
   - Exercising testing remains an important tool for determining complexity in the context of exercise

3. Patient complexity is a multifaceted and potentially transient concept.
   - Use clinical reasoning to draw all the information together to make informed decisions about exercise prescription

4. No guidelines exist that cover all clinical situations.
   - Don’t let your practice be constrained by an inability to work ‘outside the square’

Acknowledgements

The ESSA Pre-exercise Screening Working Group:

Chris Askew, Jeff Coombes, Kade Davison, Itamar Levinger, Steve Selig, Neil Smart, Andy Williams.

ESSA EXERCISE & SPORTS SCIENCE AUSTRALIA Pre-exercise Screening Working Group

Summary

- Exercise is an important aspect of disease prevention and management.
- New models are required to reflect the requirements of contemporary practice.
- Feedback is welcome!

A.Maiorana@curtin.edu.au

Case example 1

Existing chronic (cardiovascular) disease: 62 year old sedentary male, with a history of a myocardial infarction 18 months prior, wishing to commence a program of moderate intensity training.

Recommendation: The client is initially beyond the knowledge, skills and competencies of an exercise professional without clinical training (PT/ES), and should be referred to an AEP/Physiotherapist for assessment including a thorough evaluation of medical history (including medications), current signs and symptoms and exercise response to inform the exercise prescription. Commence exercise at a moderate intensity (as informed by exercise test) and progress as tolerated by increasing duration initially, followed by intensity. An AES may deliver the exercise prescription under the guidance of the AEP/Physiotherapist if the client has been clinically stable for at least three months.

Case example 2

Existing chronic (cardiovascular) disease: 62 year old sedentary male, with a history of a myocardial infarction 18 months prior, wishing to commence a program of high intensity interval training.

Recommendation: This client is beyond the knowledge, skills and competencies of an exercise professional without clinical training (PT/ES), and so should be referred to an AEP/Physiotherapist. The AEP/Physiotherapist should evaluate all available clinical information to inform the decision. A medically supervised maximal exercise stress test with additional cardiac imaging is recommended. Exercise should be commenced at a moderate intensity and progressed as tolerated.

Case example 3

Suspected cardiovascular, metabolic or renal disease: 66 year old sedentary female wishing to commence a moderate intensity aquatic exercise class for seniors. No significant medical history or risk factors but on completing a pre-exercise screening questionnaire she indicates that she routinely gets a “crushing” feeling in her chest when walking up hills or when she has to rush.

Recommendation: The client should be referred to a Medical Practitioner for review and diagnosis before exercise assessment or prescription occurs.

Case example 4

Previously active and healthy 55 year old female, who experienced a cardiac arrest shortly after completing a gym session. Subsequently diagnosed with Long QT Syndrome and fitted with an implantable cardioverter defibrillator (ICD) 3 weeks prior to referral. The patient has lost confidence but is highly motivated to return to an appropriate exercise program.

Recommendation: An exercise program should be prescribed by an AEP/Physiotherapist familiar with the precautions associated with ICDs and the implications for exercise of Long QT Syndrome. Exercise should be commenced at a low to moderate intensity in a hospital-based rehabilitation clinic and progressed as tolerated over several weeks including recommencing upper body activity at approximately 6 weeks post implantation. Resuscitation equipment, and ideally ECG monitoring, should be available. The exercise practitioner should liaise closely with the client's cardiologist in designing and progressing the exercise.

Case example 4

Cancer survivor who has recently completed a course of chemotherapy and is wishing to re-establish her baseline level of fitness.

Recommendation: The client should be assessed and prescribed exercise by an AEP/Physiotherapist with an understanding of the client's clinical situation and its implications for exercise.

Scope of Practice for Exercise Professionals

PROFESSION	MINIMUM QUALIFICATION	IN EXERCISE PRESCRIPTION FOR PATHOLOGICAL CONDITIONS, INCLUDING CLINICAL PLACEMENT	TARGET POPULATION FOR EXERCISE ASSESSMENTS AND PRESCRIPTION	EXERCISE DELIVERY
Personal trainer – PT (no clinical practical training)	A recognised fitness qualification (i.e. Certificate or Diploma) or Bachelor's degree not accredited with ESSA.	No	Healthy populations	Healthy populations
Accredited Exercise Scientist – AES (no clinical practical training)	Bachelor's degree in exercise science	No	Healthy populations	Healthy populations, clients with stable chronic conditions where an AEP/ Physiotherapist has provided the prescription and guidance
Accredited Exercise Physiologist - AEP	Bachelor's or Master's degree in clinical exercise physiology	Yes	Healthy populations through to clients with chronic disease including active cardiovascular, metabolic and renal disease.	All clients free of absolute contraindications to exercise
Physiotherapist	Bachelor's or Master's degree in physiotherapy	Yes	Healthy populations through to clients with chronic disease including cardiovascular, metabolic and renal disease.	All clients free of absolute contraindications to exercise

Type of exercise test preceding commencement of exercise prescription

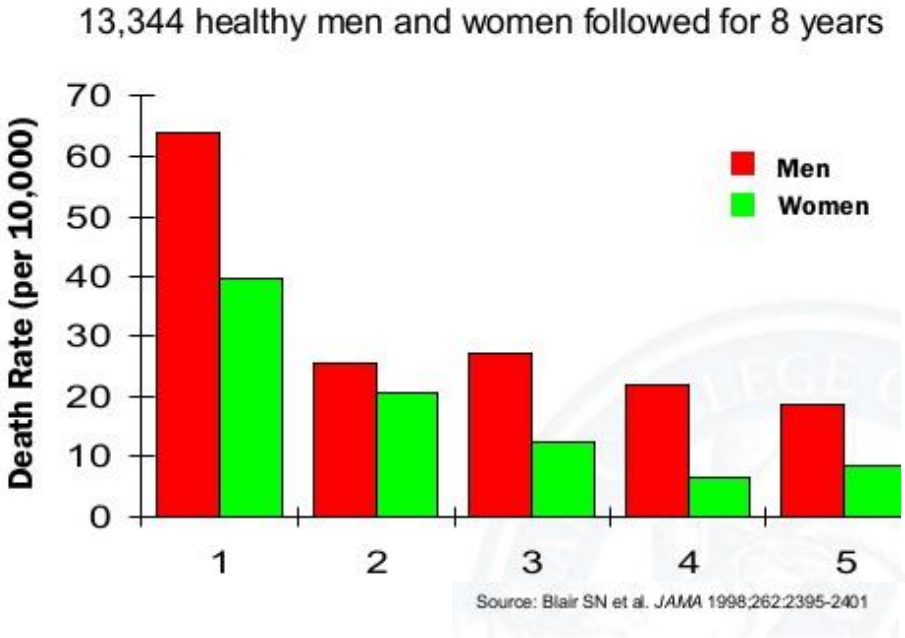
	NO INDICATION OF CARDIOVASCULAR, METABOLIC OR RENAL DISEASE	NO INDICATION OF CARDIOVASCULAR, METABOLIC OR RENAL DISEASE BUT MULTIPLE CARDIOVASCULAR RISK FACTORS	STABLE CARDIOVASCULAR, METABOLIC OR RENAL DISEASE	CARDIOVASCULAR, METABOLIC OR RENAL DISEASE, WITH RECENT EVENT OR EXACERBATION (<3 MONTHS)
PURPOSE	Determine exercise capacity for fitness assessment and exercise prescription.	Fitness assessment and exercise prescription.	• Fitness assessment and exercise prescription. • Guide exercise intensity within symptom-free limits.	• Fitness assessment and exercise prescription. • Guide exercise intensity within symptom free limits. • Diagnosis, prognosis and guide clinical decisions.
SETTING	Non-medical	Non-medical	Non-medical	Medical (hospital, medical clinic)
EXERCISE TEST PROTOCOLS	Submaximal (i.e. PWC 170 or 75) or maximal exercise test	Submaximal (i.e. PWC 170 or 75) or maximal exercise test	• Six Minute Walk Test, • Sign- and symptom-limited submaximal or maximal exercise test	Physician-supervised exercise stress test Cardiopulmonary exercise test
QUALIFICATION OF TEST SUPERVISOR	Any exercise practitioner	• Submaximal protocol: any exercise practitioner • Maximal protocol: AES, AEP, Physio.	• Submaximal protocol: AEP, Physiotherapist • Maximal protocol: AEP, Physiotherapist with ECG interpretation training	AEP, Physiotherapist with training in ECG interpretation plus medical support immediately available (i.e. performed in a medical centre or hospital).
MONITORING	Heart rate, blood pressure, RPE	Heart rate, blood pressure, RPE	Heart rate, ECG (for maximal tests), blood pressure, RPE	ECG, blood pressure, RPE, pulse oximetry

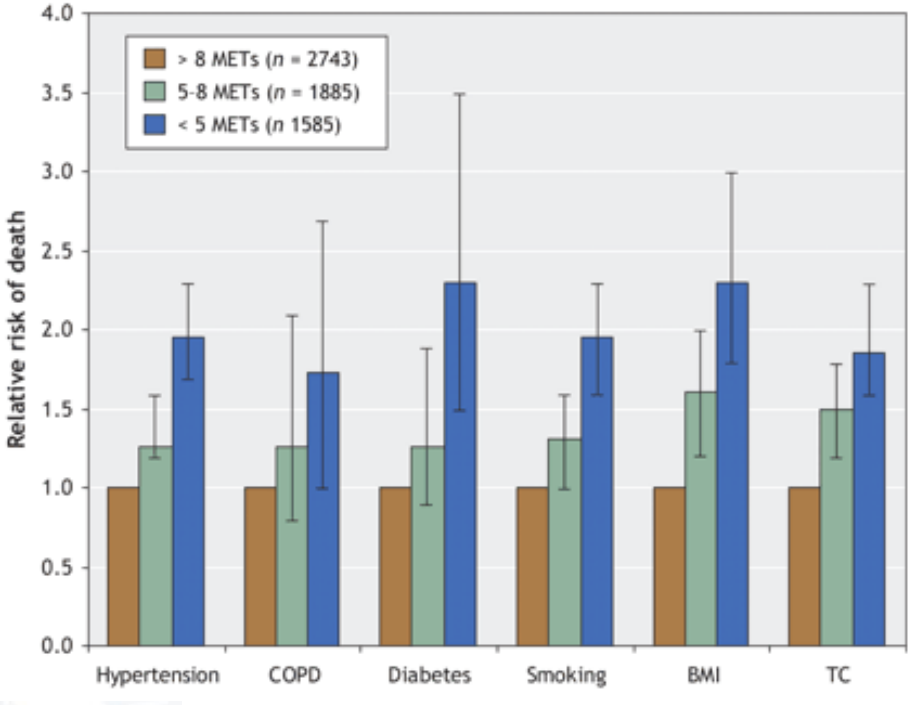
PWC – physical work capacity; PT – personal trainer, AES– Accredited Exercise Scientist; AEP – Accredited Exercise Physiologist; Physio – Physiotherapist, ECG – electrocardiogram; RPE – rating of perceived exertion

Commencing exercise prescription according to risk status

RISK STATUS	CURRENTLY EXERCISING?	INITIAL EXERCISE INTENSITY	MAXIMUM EXERCISE INTENSITY
No existing or suspected chronic disease	Yes	Usual exercise intensity	Progress up to higher intensities as exercise tolerance allows
No existing or suspected chronic disease	No	Light - moderate	Progress up to higher intensities as exercise tolerance allows
Existing/ suspected chronic disease	Yes	Moderate intensity	Moderate. Some clients may progress to higher intensities after careful assessment
Existing/ suspected chronic disease	No	Light - moderate	Moderate. Some clients may progress to higher intensities after careful assessment
Undiagnosed signs or symptoms suggestive of unstable chronic disease	Yes or No	Clients should avoid structured exercise until diagnosed by a medical practitioner or cleared of disease.	NA

Effects of fitness and physical activity on all cause mortality





Myers et al, N Engl J Med. 2002

When things go wrong, they can go badly wrong…

NEWS

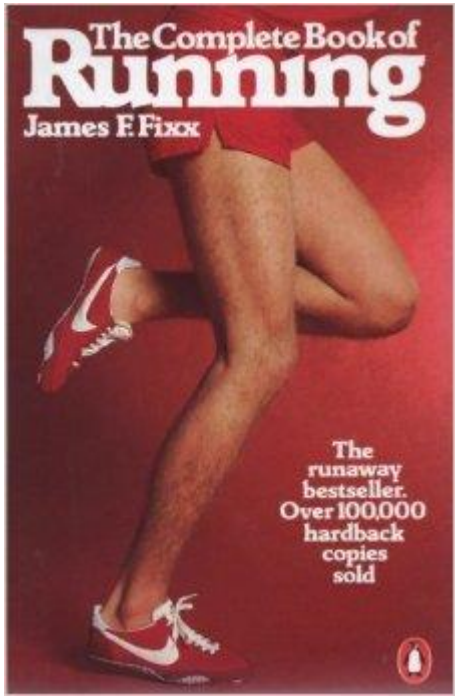
Runner dies while competing in Coast Run Series event

Runners begin the course.

Supplied Facebook

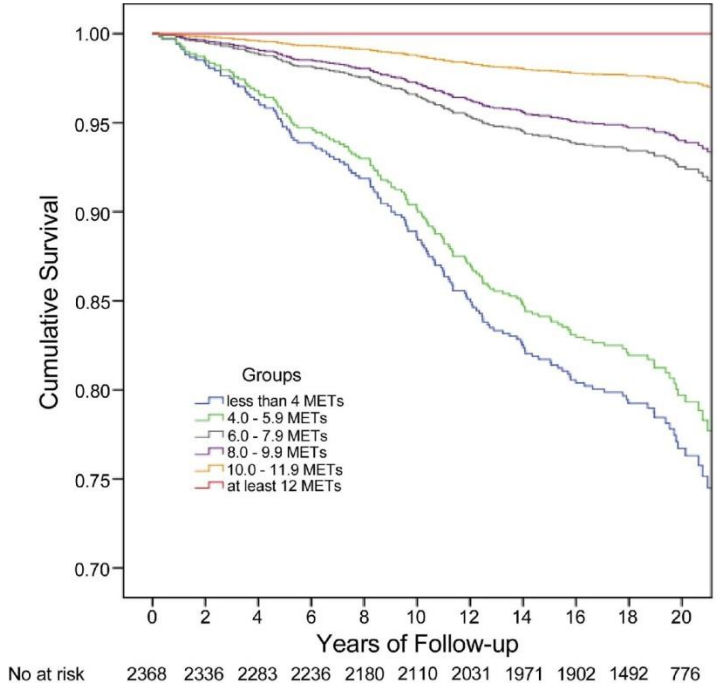
RELATED ITEMS

UPDATE: A 55-year-old man has died while competing in a Sunshine Coast Run Series event in Yaroomba on Sunday morning.

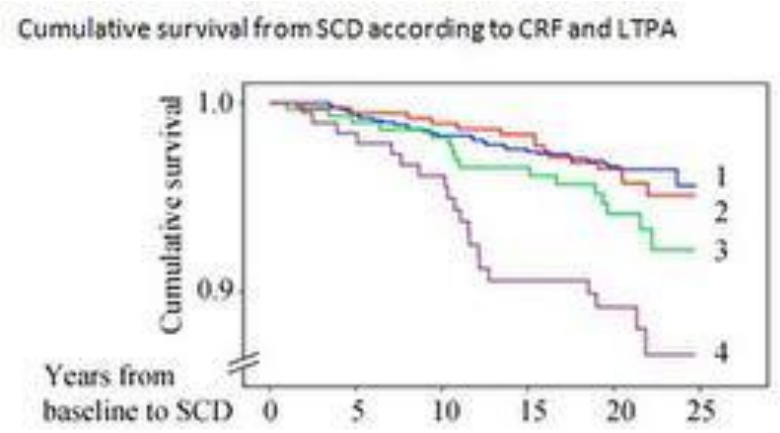


"Fixx had experienced warning symptoms which he chose to ignore and had refused the option of undergoing a maximal exercise stress test."

Effects of fitness and physical activity on sudden cardiac death



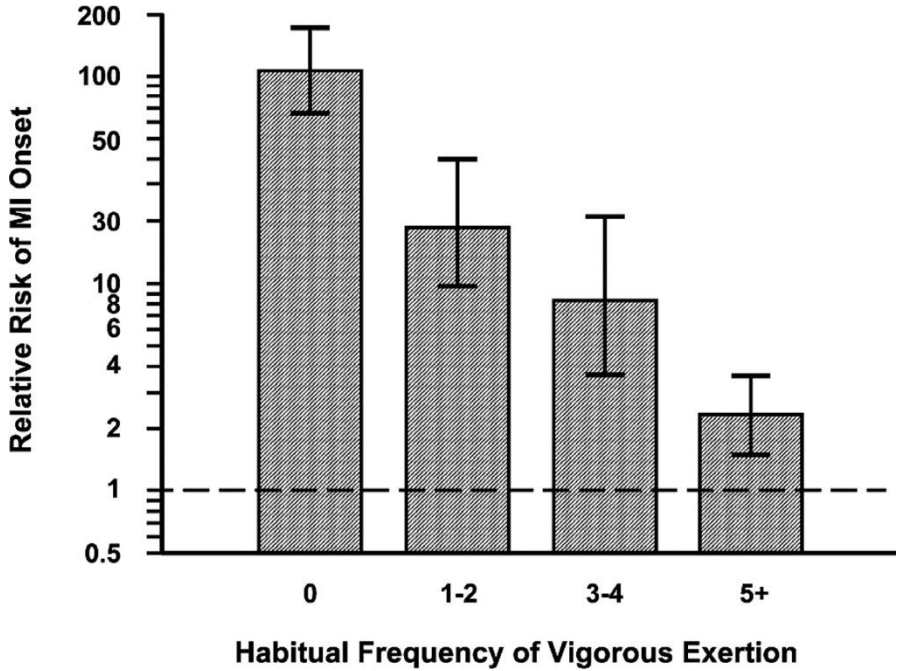
Laukkanen et al. JACC 2010;56:1476-1483



1. High fitness and high LTPA
2. High fitness and low LTPA
3. Low fitness and high LTPA
4. Low fitness and low LTPA

Laukkanen et al. ESC 2013 (abstract)

Exercise reduces the risk of exercise



The risk of an exercise-induced AMI was 50x greater in habitually inactive individuals than for those who exercised vigorously 5 x wk.

Mittleman et al. 1993 NEJM; 329:1677-83

Exercise in medical education

Overview of physical activity training in Australian medical curriculum.

	Frequency (%)
The institution believes that medical students are interested in receiving PA training	12/17 (70.6%)
The institution feels that it is their responsible for providing medical students PA training	17/17 (100%)
The institution provides specific training on PA in the medical curriculum	15/17 (88.2%)
The institution has specialized instructors to provide PA training in the curriculum[a]	6/14 (42.9%)
The institution teaches the national recommendations for aerobic activity	13/15 (86.7%)
The institution teaches the national recommendation for strength training	7/15 (46.7%)
The institution prepares students to effectively refer their patients to accredited exercise professionals[a]	9/14 (64.3%)
The institution currently provides a sufficient level of PA training to the medical students[a]	6/14 (42.9%)
The institution plans to increase the level of PA training offered to medical students	6/15 (40.0%)

PA: Physical activity.

Strong et al. / Journal of Science and Medicine in Sport 20 (2017) 534–538

Updated ACSM Recommendations

(Riebe et al 2015. MSSE; 47: 2473-9)

Changes from previous guidelines:

- Number of risk factors no longer considered
- Risk stratification is no longer used

Focus on:

- Current level of physical activity
- Presence of signs or symptoms and /or known cardiovascular, metabolic, renal disease
- Desired exercise intensity

Exercise medication education should be expanded! Joyner et al BJSM 2017

"Medical education related to exercise should be expanded. Physicians need to be aware of what is possible with intensive exercise programmes versus the marginal outcomes associated with inadequate interventions occurring in a low physical activity high calorie environment."