Irish Heart Foundation Position Statement on Physical Activity

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Introduction

The health benefits of physical activity are long known. Hippocrates observed that "all parts of the body if unused and left idle become liable to disease". Physical activity is inversely related to heart disease.[1,2] and promotes longevity,[3] Even low level regular exercise can produce significant health benefits.[4,5,6] In contrast, physical inactivity is considered a major risk factor for developing heart disease.[7] Despite these exercise benefits, many people are inactive world-wide possibly due to lack of information on how to exercise or fear that it could do them harm.

Physical activity promotes:

- Health benefits
- Psychological benefits
- Economic benefits
- Social benefits

Health Benefits

Coronary heart disease (CHD) causes twice as many deaths in Ireland (52 per 100,000 population.in the 0 to 64 year age group[8]) as in other EU states. This is also true in the older age group who will account for over 20% of our population by the year 2020. The following major risk factors are associated with CHD development: *High Cholesterol, Cigarette smoking, Hypertension Diabetes Mellitus, Obesity*

In 1992 the American Heart Association upgraded *Physical Inactivity* to the status of a Major risk factor for CHD development. Increased physical activity favourably affects blood lipids, obesity, hypertension, glucose tolerance, stress and cigarette smoking which positively impacts the risk of CHD [9,10,11,12] Exercise also favourably influences diabetes mellitus, osteoporosis, arthritis, obesity, respiratory disease and the physically challenged.

Psychological Benefits

Increased physical activity improves mental well being by reducing stress anxiety and depression and improving mood [13,14,15,16,17]. It improves cognition [18] self-control, self-efficiency and self-esteem.[19]

Economic Benefits

Increased physical activity positively impacts work related activities and productivity. Exercise programmes at work, reduce absenteeism, increase productivity, turn over and sales. They also reduce industrial injury and health insurance premiums [20].

Social Benefits

We regard ourselves as a sporting nation and have some unique Irish sports such as Hurling, Gaelic Football and Handball. Presently over 2500 Gaelic games sports clubs exist. At an individual level enhanced physical fitness has many positive social effects, improves mood and helps people adopt healthier life styles [21]. Team sports encourages young people to socialise, to appreciate teamwork, to take responsibility and work towards common goals. These social skills are invaluable for future life experiences. As leisure time increases and retirement age falls, sport and physical activity provide a means of adapting to this lifestyle change [22,23].

Risk and Precautions with exercise.

All exercise carries a small but definite risk of sudden death [24]. This is in the order of one death per year in a population of 1500-2000 adult exercisers [25]. In a study of 4 million runners the mortality was 3/10,000 [26]. It is important to note that the cause of exercise related death is due to a pathological process rather than exercise itself. Individuals who were sedentary have the greatest risk of sudden death during physical activity. Thus careful exercise prescription and progression is essential for safe participation. A pre-participation medical examination is advised in sedentary individuals and those over 35 year old. Exercise testing is performed in selected patients.

Pre-participation Screening

The baseline medical examination will identify potentially serious disease and also provides a baseline to measure subsequent health gain. It can act as a spur to an unenthusiastic exerciser. Care should be taken to assess individuals likelihood of complying with the specifics of the prescription.

High risk patients include those with these

Clinical Features

- Multiple myocardial infarctions
- Poor left ventricular function (ejection fraction <40%)
- History of chronic congestive heart failure
- Rest or unstable angina pectoris
- Complex dysrhythmias
- Severe Coronary artery disease
- Aortic stenosis

Exercise Test Responses

- Low exercise tolerance (less than 4 METS).
- Severe ischaemia : ST depression 1mm @ a low heart rate and systolic pressure product (RPP) e.g. HR 100/ minute x SBP of 120 = RPP of 12000.
- Angina pectoris at low work loads
- Decreasing systolic blood pressure response to exercise.
- Complex cardiac dysrhythmias

Psychological traits

Patients who exercise above the prescribed limit.

Exercise Prescription

AEROBIC ACTIVITY

Exercise Prescription of Aerobic Exercise

The purpose of an exercise prescription is to ensure safe, enjoyable and beneficial participation.
Its elements comprise:

1. Mode
2. Intensity
3. Frequency
4. Duration.

Mode

The aerobic activity should be rhythmical, continuous, large muscle activity. It is important to pick an activity, which the individual is skilful in, or an activity, which has a low skill level. Tennis for example requires a high skill level and only the accomplished racket player will derive significant benefit, as he or she will be able to complete multiple shot rallies compared to the novice player.

Walking, bike riding, jogging and hiking are all acceptable inexpensive aerobic activities. Walking in particular is appropriate as it requires no specific skills or equipment. Compliance with walking programs is also usually high.[27]

Intensity

The purpose of the intensity prescription is to monitor and control the intensity of exercise in a range which will allow safe and effective exercise. It guides the participant into a safe training range or "window".

To prescribe an intensity of exercise accurately, it is essential to know the baseline functional capacity of the individual. The graded exercise test remains the most widely used tool to evaluate functional capacity. Once established, the exercise intensity can be expressed as a percentage of the functional capacity. In general, exercise intensity should be prescribed within the range of 40-85% of the functional capacity. Typically the conditioning intensity for a healthy adult is between 60-70% of the functional capacity. Cardiac patients with low functional capacity are often prescribed conditioning intensities in the order of 40-60% of functional capacity [28] .

Methods used to express the exercise intensity in relative terms, include:

1. Exercise prescription by heart rate.
2. Exercise Prescription by rating of perceived exertion (RPE).
3. Exercise Prescription by metabolic equivalents (METS).

1. Exercise prescription by heart rate

In normal health there is a linear relationship between heart rate and exercise intensity. Using this relationship, a range of heart rates will approximate to a percentage of functional capacity (VO2 Max). Maximum heart rate percentage does not have a direct linear relationship with VO2max. Heart rate reserve on the other hand does, and is a more appropriate method of intensity prescription. Heart rate reserve is calculated by subtracting the resting heart rate from the maximum heart rate achieved on stress testing. The product of the appropriate exercise intensity percentage and the heart rate reserve are added to the resting heart rate. Training range of heart rates can thus be achieved.

(See Figure 1

Max Heart rate = 190 beats/min

Resting Heart rate = 60 beats/min

Heart rate reserve = 130 beats/min

Recommended intensity is 50% - 60% of functional capacity

{i.e.50%-60% of heart rate reserve} =65-78 beats/min

Training intensity by heart rate reserve method

125 beatsmin-138beats /min

{i.e. Resting heart rate + calculated % of heart rate reserve}

Figure 1 Intensity calculated by heart rate reserve method.

In health, heart rate is an accurate method of prescribing exercise intensity, however careful consideration should be given to conditions and situations that can alter pulse rate response to exercise (extreme temperature, altitude and viral illnesses, cardiac failure and cardiac medications).

2. Exercise prescription by RPE

Rating of perceived exertion (RPE) is another method of defining an exercise intensity. A subject can be educated in rating his exercise intensity on a scale while in a supervised environment. One such scale has 15 numerical points ranging from 6-20. There is a verbal description provided at every odd number (The Borg Scale) [29,30]. The subject learns to listen to his body and rate his intensity while he is exercising. This method is useful once the subject has developed an accurate knowledge of rating of perceived exertion. However, a percentage of participants (approximately 10%) select abnormal or unrealistic RPE scores and for these people this method for exercise intensity prescription is ineffective. [31]. The method is useful when heart rate for intensity monitoring is inaccessible or inappropriate.

3. Exercise prescription by METS

A metabolic equivalent is a unit used to estimate the metabolic cost of physical activity relative to resting metabolic rate. One MET is approximately = 3.5 mls of oxygen consumed per kilogram of body weight per minute. Therefore, 1 MET is = resting metabolic rate. Research has identified the energy requirements of selected activities and tables exist as to the MET energy requirements of many activities. [25,32].

This method of intensity monitoring allows the physician to select an activity which falls within a desired exercise intensity. Selection of an activity therefore "factors in" the desired intensity.

For example, an individual who has a functional capacity of 10 METS (VO2 Max ≃ 35ml/kg/min) is advised to take exercise at a level of 40-60% of his functional capacity. Activities such as leisure cycling (3.5 METS), gardening (4.4. METS) and golfing (4.9 METS) can be selected.

Ideally exercise intensity prescription should utilise a combination of all three methods of intensity prescription (Heart rate, RPE and MET) as it ensures variety and may assist with patient compliance in the exercise programme.

Frequency

For optimal improvement in aerobic fitness and health benefit, exercise sessions should take place 3 to 5 days a week[33]. Aerobic fitness tends to plateau at a frequency level of 3 days a week. Patients who have poor functional capacities (below 5 METS) or who are severely limited by symptoms may exercise more frequently during a single day, but for short durations (i.e. 5 minutes several times a day).

Duration

Low to moderate intensity activity of long duration is now recommended for the exercising individual [33]. This type of activity is safer and has been shown to reduce the risk of certain chronic degenerative diseases [34,35,36]. It is suggested that the duration of training for a non-athletic adult should be 20-60 minutes of continuous aerobic activity. Lower intensity activities should be conducted for longer periods of time[25,32,33]. and should be exclusive of "warm-up" and "warm down".

Factors peculiar to exercising in Ireland

In Ireland there is significant variability in sunlight from season to season. Sunlight hours vary from 15-16 hours in summer to 7-8 hours in winter. Gym based activities have flourished here over the last ten years.
Stationery cycling is one of the best aerobic activities as it is a rhythmical large muscle activity. These machines allow one to self-monitor the intensity and duration of activity and with time to make adjustments in these measures.

Stair steppers produce a similar metabolic response to treadmill exercise [37] but their use should be cautioned in patients with severe heart failure as it may result in significant fatigue and dyspnoea [38]. These machines are easily regulated and provide information to monitor exercise intensity, duration and progression. Careful regulation and understanding of these devices is necessary to ensure safe participation.[39]

RESISTANCE EXERCISE

Prescribing Resistance Exercise

Most exercise prescriptions relate to aerobic activities which produce significant health benefits. However, recent research has suggested that strength training is also an important element of an exercise prescription and should be included in exercise programmes particularly for the older individual. Strength training is considered safe and does not increase the incidence of ischaemia, arrhythmia or angina pectoris [40,41,42]. This activity prevents the age-related decline in muscle function and performance that occurs linearly from the age of approximately 31 years of age[43] . Specific contra-indications to resistance training include acute inflammation of arthritic joints, uncontrolled arrhythmia's, unstable angina pectoris or a recent history of congestive heart failure. Blood pressure should be stabilised prior to commencing a resistance type activity.

Protocol for selection of resistance levels.

Selecting an initial weight for resistance exercise is often very difficult [44]. We would recommended that one starts at 30% of a 1-maximum repetition lift and gradually increase up to 80% [45]. The subject should build up to 12-15 repetitions per set. Three resistance sessions are recommended each week to allow adequate time for muscles to recovery.

Anatomy of A Workout

All exercise sessions should follow a pre-set routine of gentle warm up and stretching of the muscles to be exercised and warm down following the exercise session. An adequate warm up period may delay the angina threshold in patients with ischaemic heart disease [46]. Sudden exercise alternatively has been reported to increase the risk of a cardiac event [26] .

The warm up should involve general callisthenics exercises and specific skill rehearsal exercises in the planned activity. The time period after vigorous exercise is known as the *post exercise vulnerable period*, as there is an increased risk of cardiac arrhythmia.[47,24,48.] Warm down exercise may help to reduce this risk.

Anatomy of a work out

- Warm up
- Stretch appropriate muscles
- Exercise
- Warm down.

Progression

Progression of an exercise programme is a difficult to quantify as no specific rules exist for this phase of the exercise programme. After 2 months of an exercise program the training effect may start to plateau, and progression is required. Emphasis on increasing the duration and frequency of exercise rather than the intensity will ensure safe participation. New activities should be introduced at this stage.

Maintenance

The patient and his programme should be regularly reviewed to ensure safe participation and also to ensure that the patient's own *personal* goals are being achieved. Failure to do so will undoubtedly increase the drop out rate which is common if the participants consider the program too hard or too easy. Re-establishing goals or creating new goals are helpful in keeping the participant interested. Recreational activities should be included to ensure enjoyable as well as beneficial participation.

Overview

The benefits of exercise to individuals is well established at a physical, health, social, psychological and economic level. Engaging in low intensity exercise reduces mortality rates and morbidity rates significantly. Large proportions of the population do not engage in regular exercise. Healthcare professionals should be proactive in dissipating positive information regarding safe exercise participation, thus counteracting the risk factor of physical inactivity.

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