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Cardiovascular evaluation of middle-aged/senior individuals engaged in leisure-time sport activities: position stand from the sections of exercise physiology and sports cardiology of the European Association of Cardiovascular Prevention and Rehabilitation

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Abstract

Regular aerobic exercise at moderate intensities and an increased physical fitness are associated with a reduced risk of fatal and nonfatal coronary events in middle-aged individuals. In contrast, moderate and vigorous physical exertion is associated with an increased risk for cardiac events, including sudden cardiac death in individuals harbouring cardiovascular disease. The risk-benefit ratio may differ in relation to the individual's age, fitness level, and presence of cardiovascular disease; sedentary individuals with underlying coronary artery disease are at greatest risk. The intention of the present position stand of the European Association of Cardiovascular Prevention and Rehabilitation is to encourage individuals to participate in regular physical activity and derive the benefits of physical exercise while minimizing the risk of cardiovascular adverse events. Therefore, the aim is to establish the most practical method of cardiovascular evaluation in middle-age/senior individuals, who are contemplating exercise or who are already engaged in nonprofessional competitive or recreational leisure sporting activity. These recommendations rely on existing scientific evidence, and in the absence of such, on expert consensus. The methodology of how middle-aged and older individuals should be evaluated appropriately before engaging in regular physical activity is both complex and controversial. On practical grounds the consensus panel recommend that such evaluation should vary according to the individual's cardiac risk profile and the intended level of physical activity. Self assessment of the habitual physical activity level and of the risk factors, are recommended for screening of large populations. Individuals deemed to be at risk require further evaluation

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by a qualified physician. In senior/adult individuals with an increased risk for coronary events, maximal exercise testing (and possibly further evaluations) is advocated. Hopefully, the recommendations in this paper provide a practical solution for facilitating safe exercise prescription in senior/adults.

Keywords
Cardiovascular, death, European Association of Cardiovascular Prevention and Rehabilitation position stand, exercise, prevention, risk factors, screening, sudden

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Background

Over the past few decades several studies have shown that participation in regular physical activity (PA) is associated with a decrease in all-cause mortality, particularly from cardiovascular disease (CVD).[1–5] Indeed, regular aerobic exercise at moderate intensities and an increased physical fitness[6–8] are associated with a reduced risk of fatal and nonfatal coronary events in middle-aged individuals. The beneficial effects of aerobic exercise are partly mediated through modification of several risk factors for coronary artery disease (CAD), including components of the metabolic syndrome, notably insulin sensitivity, lipid profile and blood pressure.[9,10] Additional effects on endothelial dysfunction, autonomic balance and blood coagulation have also been postulated.[9,11–13]

Although a dose—response relation between PA and health has been documented,[5,14–17] there is evidence that even modest PA, three times a week, is associated with a beneficial effect on general health.[18] Conversely, there are ample reports indicating that vigorous physical exertion is associated with an increased risk for cardiac events, including sudden cardiac death (SCD) in individuals harbouring CVD.[19–24] The risk-benefit ratio may differ in relation to the individual's age, fitness level, and presence of CVD; sedentary individuals with underlying CAD are at greatest risk.[24–26] The mechanisms by which bouts of intensive exercise may trigger cardiac events, including SCD, are probably mediated through activation of the sympathetic nervous system and increasing circulating catecholamines, which increase myocardial susceptibility to potentially fatal ventricular arrhythmias, as well as, platelet adhesion and the risk of atherosclerotic plaque rupture.[9,21,27,28] However, it is pertinent to emphasize that acute cardiac events including SCD during or immediately after exercise are relatively rare.[19,23,24,29]

Habitual exercise training may diminish the risk of acute myocardial infarction and SCD in healthy individuals[30] and in patients with established CAD.[31] Consequently, PA is deemed essential in both primary and secondary cardiovascular prevention.[18] However, considering the potentially increased, *albeit* small risk of cardiac events and SCD during PA it is prudent to establish practical and pragmatic algorithms for the cardiovascular evaluation of middle-aged/senior individuals (≥35 years) before engaging in regular PA.

In Europe, the focus on preparticipation cardiovascular evaluation is confined predominantly to young (<35 years old) competitive athletes[32–35] or to athletes with CVDs.[36,37] In contrast with the American experience,[38–41] there are no European screening recommendations for cardiac evaluation in apparently healthy middle-aged or older individuals participating in recreational sporting activities.

Aims

The aim of this study is to establish the most practical method of cardiovascular evaluation in middle-aged/senior individuals, defined as older than 35 years of age, who are contemplating exercise or who are already engaged in nonprofessional competitive or recreational leisure sporting activity. It is our intention to encourage individuals to participate in regular PA and derive the benefits of physical exercise while minimizing the risk of cardiovascular adverse events. These recommendations rely on existing scientific evidence, and in the absence of such, on expert consensus.

Rationale

The methodology of how middle-aged and older individuals should be evaluated appropriately before engaging in regular PA is both complex and controversial. On practical grounds the consensus panel recommend that such evaluation should vary according to the individual's cardiac risk profile and the intended level of PA.

The individual risk profile

Increasing evidence indicates that risk evaluation in the clinical setting should rely on the presence or absence of

classical risk factors for CAD and individual fitness level or level of PA.[8] The individual risk profile could thus be estimated from: the burden of known classical risk factors; and the current level of habitual PA undertaken by the individual as a marker of the cardiorespiratory fitness.[42]

Burden of risk factors for coronary artery disease

The risk profile for individuals aged above 35 years is ascertained by the identification of traditional risk factors for CAD, which is the major cause of SCD in this age group.[43] The prevalence of underlying precipitating atherosclerosis (including CAD) increases with age, therefore the most senior population of exercising individuals are at highest risk regardless of the presence of other risk factors.

The identification of risk factors for CAD can be achieved in several ways. For the purpose of this paper, the consensus group recommends that the first line of risk evaluation should be in the form of a self assessment (by the individual or by nonphysician health related professionals) using validated questionnaires such as the American Heart Association (AHA) Preparticipation Questionnaire[39] (Table 1) or even the simpler revised Physical Activity Readiness Questionnaire[39,44,45] (Table 2). This method of self assessment could be used easily for large groups of individuals, thus avoiding additional and unnecessary obstacles towards increasing the PA level within the general population.

In addition, more thorough assessment could be performed by a qualified physician, using the European Society of Cardiology (ESC) Systematic Coronary Risk Evaluation (SCORE)[46] (Figure 1). The SCORE system is currently recommended by the ESC to assess cardiovascular risk and is derived from a large data set of prospective European studies.[18,46] The estimated absolute risk of atherosclerotic cardiovascular death within 10 years is based on age, sex, blood pressure, cholesterol and smoking history.[46] The consensus group encourages compliance with the SCORE system for risk stratification, as used in the recommendations for PA/sports in athletes with ische-mic heart disease.[37] In addition to the SCORE system, consideration should be given to additional major accepted risk factors to define whether individuals have a high versus low-risk factor profile,[37] as outlined below:

The high-risk factor profile for developing a fatal cardiovascular event is defined as one of the following:

1. The presence of multiple risk factors, resulting in a 10-year risk greater than 5% now, or if extrapolated to 60 years age in the SCORE chart (Figure 1);
2. Markedly raised blood total cholesterol (> 8 mmol/l = 320 mg/dl), low-density lipoprotein-cholesterol (>6 mmol/l = 240 mg/dl) or blood pressure greater than 180/110 mmHg;
3. Diabetes mellitus with microalbuminuria, as individuals with diabetes mellitus have the same risk as patients with stable angina, for a future coronary event;
4. Individuals with a strong family history of premature CVD in first degree relatives below 50 years, and individuals with a body mass index greater than 28 are added to this group (SCORE-PLUS), as used in existing recommendations.[37]

In contrast, a low-risk factor profile for developing a cardiovascular event in individuals is defined as less than 5% 10-year risk according to SCORE,[18] without a history of diabetes mellitus, or a positive family history for CAD and a body mass index less than 28.

The current level of habitual physical activity

PA is defined as any bodily movement produced by skeletal muscles that result in energy expenditure beyond resting expenditure. It can be easily quantified by methods such as motion sensors (pedometers and accelero-meters), heart rate monitors or PA questionnaires and interviews attempting to measure the frequency, intensity, type and duration of PA performed.[47,48] However, it should be accepted that there is no ideal measure of PA.

Individual aerobic capacity may be assessed by simple field test procedures such as the Cooper walk run test,[49] the Shuttle test[49] or the step test.[50] In addition, exercise capacity in a laboratory is preferentially evaluated through maximal incremental exercise testing, which provides a wealth of clinically diagnostic and prognostic information.[51]

The total dose or volume of PA (i.e. total energy expended) is a function of its intensity, duration and frequency.[40,41] Intensity of all physical activities can be defined in absolute terms and reflects the rate of energy expenditure during one specific exercise, which is expressed in metabolic equivalents or METS. 1 MET equals the resting metabolic rate of 3.5 ml O_2/kg/min.

For a comprehensive listing of MET values for different physical activities, see tabulation by Ainsworth and colleagues.[52]

The total volume of habitual PA level (volume = intensity × duration or MET-h/week = METS × duration) is a marker that has been shown to discriminate individuals with low and high fitness levels.[42] At present, neither the level of PA nor physical fitness

Table 1. American Heart Association/American College of Sport Medicine Health/Fitness Facility Preparticipation Screening Questionnaire

Section I
History
You have had:
A heart attack
Heart surgery
Cardiac catherization
Coronary angioplasty (PCI)
Pacemaker/implantable cardiac defibrillator/rhythm disturbance
Heart valve disease
Heart failure
Heart transplantation
Congenital heart disease
Symptoms
You experience chest discomfort with exertion
You experience unreasonable breathlessness
You experience dizziness, fainting, blackouts
You take heart medications
Other health issues
You have musculoskeletal problems
You have concerns about the safety of exercise
You take prescription medication(s)
You are pregnant
If you have marked any of the statements in section I, consult your healthcare provider before engaging in exercise. You may need to use a facility with a medically qualified staff
Section II: cardiovascular risk factors
You are a man older than 45 years
You are a woman older than 55 years or you have had a hysterectomy or you are postmenopausal
You smoke
Your blood pressure is > 140/90 or you do not know your blood pressure
You take blood pressure medication
Your cholesterol level is >240mg/dl or you do not know your cholesterol level
You have a close relative who had a heart attack before the age of 55 (father or brother) or 65 years (mother or sister)
You are diabetic or take medicine to control your blood sugar
You are physically inactive (i.e. you get <30min of physical activity at least 3 days/week)
You are >20 pounds overweight
If you have marked 2 or more of the statements in this section, consult your health care provider before engaging in exercise. You might benefit by using a facility with a professionally qualified exercise staff to guide your exercise program
None of the above (section 1 and 2) is true
You should be able to exercise safely without consulting your healthcare provider in almost any facility that meets your exercise program needs

Adopted from Balady. *Circulation* 1998; 97:2283-2293. PCI, percutaneous coronary interventiom.

Table 2. Revised Physical Activity Readiness Questionnaire

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

Adopted from Balady. *Circulation* 1998; 97:2283-2293.

is incorporated into the SCORE risk assessment, but may offer important additional information to the risk assessed by the SCORE system, identifying less fit or less active individuals at higher risk,[53] similar to the Framingham risk score.[54]

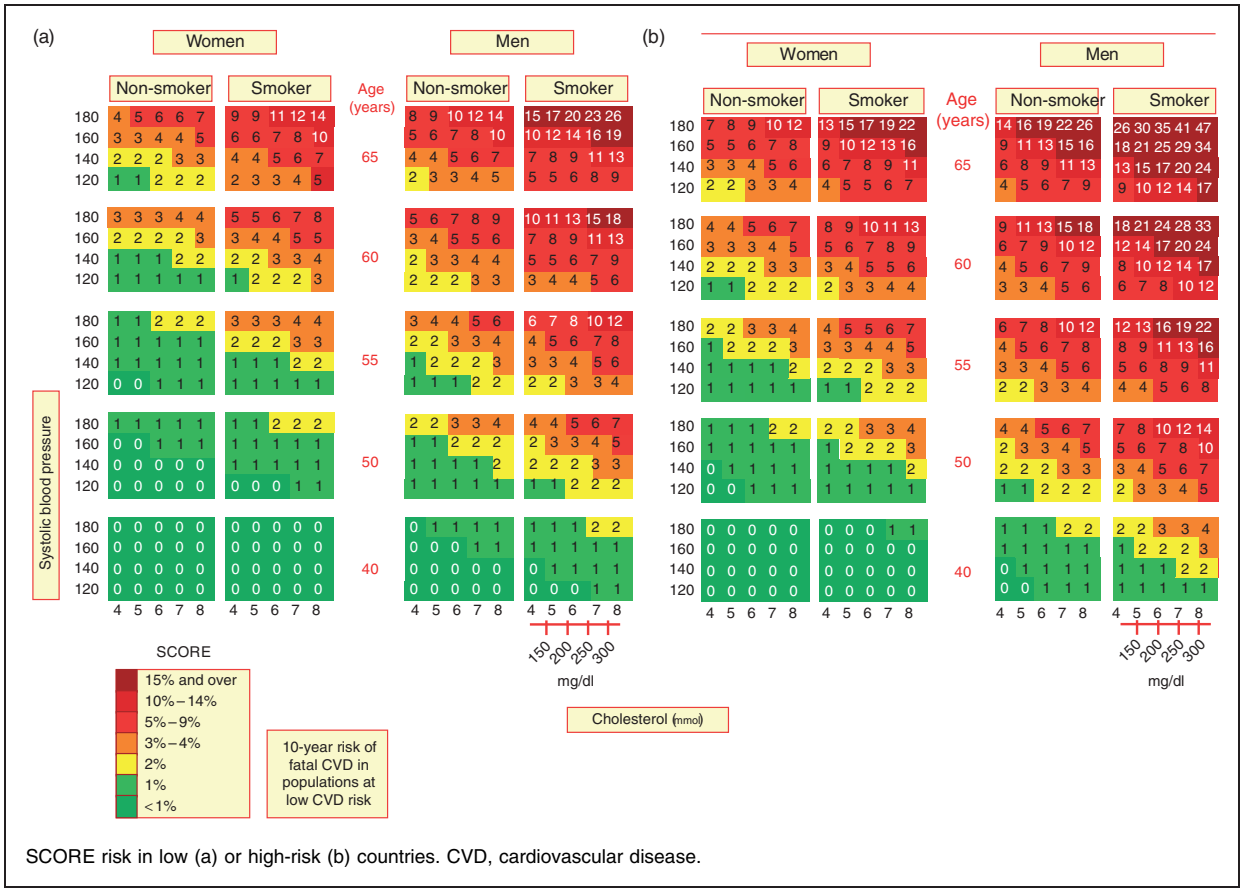
For the purpose of the paper, middle-aged/older individuals willing to participate in leisure-time sports are categorized according to their habitual PA level into two major groups as follows:

Sedentary individuals are defined as individuals whose energy expenditure during PA accumulates to less than 2 MET-h/week. This low activity has been associated with higher coronary event rates and a poorer prognosis. These recommendations consider low cardiorespiratory fitness equivalent to having a high risk according to SCORE.

Active individuals are defined as those accumulating ≥2 MET-h/week, even intensive, although noncompetitive sport activities.

The intended level of physical activity

The relative intensity of PA undertaken will influence the burden on the cardiovascular system. However, the designation of the intensity of exercise as 'moderate' or 'vigorous' has to be related to individual exercise tolerance rather than on absolute measures such as METS. For example, walking at 6km/h in an older and unfit individual may be representative of vigorous rather than low-moderate intensity of exercise. This difference



SCORE risk in low (a) or high-risk (b) countries. CVD, cardiovascular disease.

Figure 1. SCORE risk in low (panel a) or high-risk (panel b) countries. CVD, cardiovascular disease.

in absolute or relative exercise intensity is essential for individual screening purposes and exercise prescription and warrants evaluation with methods such as the Talk test[55] or other field or advanced laboratory tests described above.[47]

The type of sport is classified according to classifications derived earlier.[56] Sports activities are usually classified into two main categories, notably dynamic and static, and the intensity is divided into low, moderate and high.

Middle-aged/older individuals are stratified in three groups based on the relative intensity of intended PA, assessed by the individual or by a nonphysician:

1. Low intensity intended PA, corresponding to 1.8-2.9 METS
2. Moderate intensity intended PA, corresponding to 3-6 METS
3. High intensity intended PA, including individuals participating/willing to participate in masters events such as long-distance cycling, city marathons, long distance cross-country skiing and triathlons, corre sponding to greater than 6 METS.

Normal versus abnormal evaluation

According to the results of evaluation by a qualified physician, the individuals may be divided into those with an abnormal versus those with a normal evaluation:

An evaluation is considered abnormal (positive) in the presence of findings indicating the possibility of underlying CVD by the identification of (i) a high-risk profile on SCORE (as defined above), (ii) the presence of alarming symptoms (chest pain, syncope), (iii) abnormal findings on physical examination or the (iv) detection of an abnormality on the ECG (arrhythmias, preexcitation, ischemia).

An evaluation is considered normal (negative) in the absence of (i) to (iv) above.

Recommendations

Based on the individual risk profile and the type or intensity of intended PA, the following levels of cardiovascular evaluation are recommended as appropriate

for middle-aged/older sedentary or regularly active individuals, respectively (Figures 2 and 3).

Sedentary individuals (Figure 2)

General comments: Sudden vigorous exertion and engagement in competition should be avoided in the early stages of PA and/or reconditioning. Consequently, sedentary individuals are strongly advised to start a PA programme gradually increasing the duration and intensity of exercise while monitoring any signs and symptoms that may reflect possible cardiovascular problems. In this paper, we recommend tailoring the evaluation procedure according to the

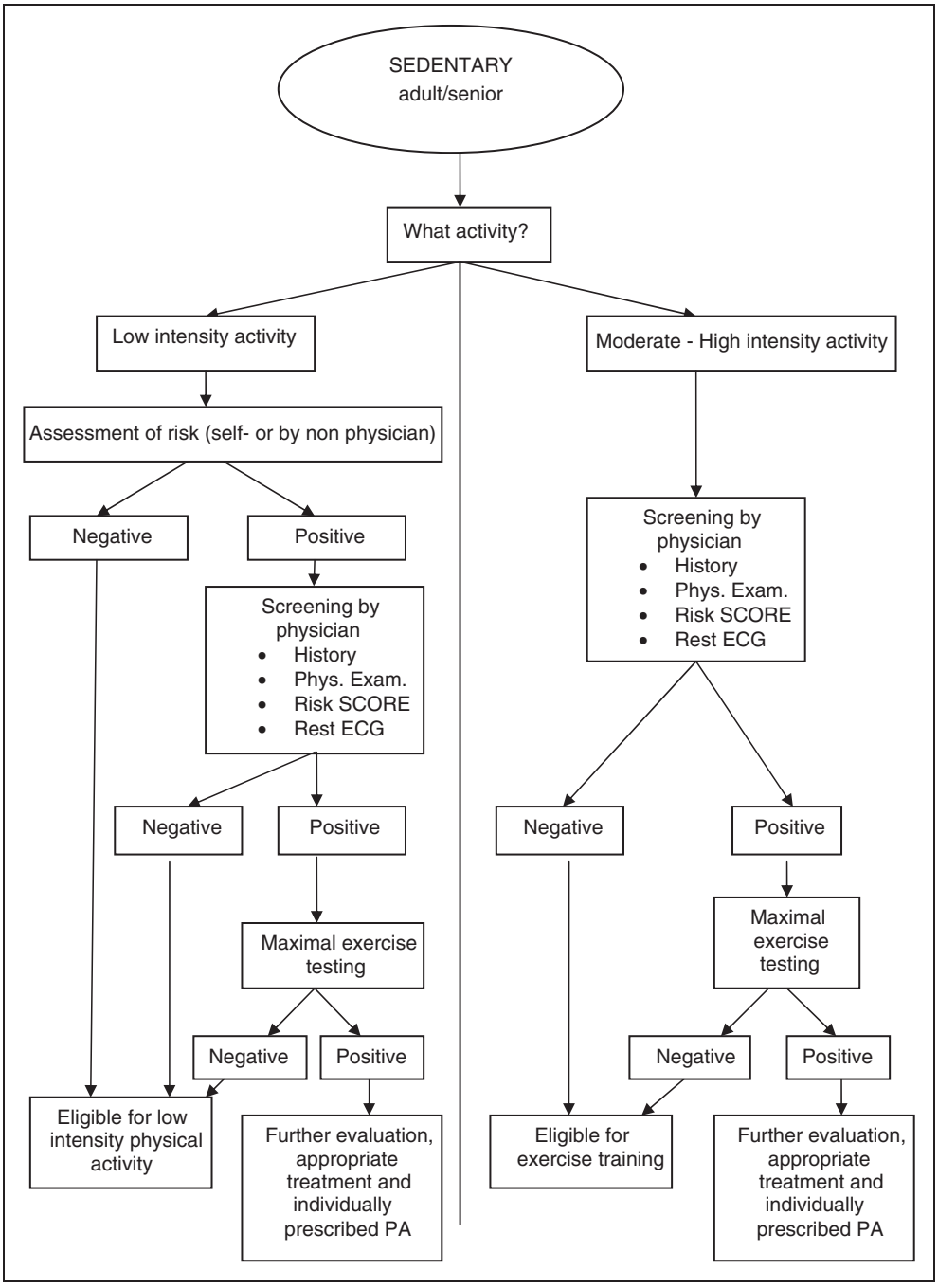


Figure 2. Proposed preparticipation cardiovascular evaluation protocol for asymptomatic sedentary adult/senior individuals. PA, physical activity.

intensity of PA the sedentary individual is planning to undertake.

Low-intensity activity

Middle-aged/older sedentary individuals who wish to engage in low-intensity PA (< 3 METS) are considered eligible without further evaluation, if the assessment of risk using validated questionnaires is considered negative (above).

Middle-aged/older sedentary individuals with a positive self assessment by questionnaire (symptoms or a positive history of CVD) are advised to undergo additional thorough evaluation by a qualified physician, including reassessment of personal and family history, cardiovascular risk SCORE physical examination, and a resting 12-lead ECG.[57] Those individuals who are classified as having a low-risk profile should be allowed to engage in low-intensity activity, without further assessment.

Sedentary individuals with symptoms or a positive history of CVD (positive self assessment), and a risk SCORE greater than 5%, should have a maximal exercise test as part of the physician's evaluation before engaging in regular (even low intensity) exercise. If the exercise test is abnormal and exhibits features of inducible myocardial ischemia, malignant arrhythmias, a pathological blood pressure response to exercise

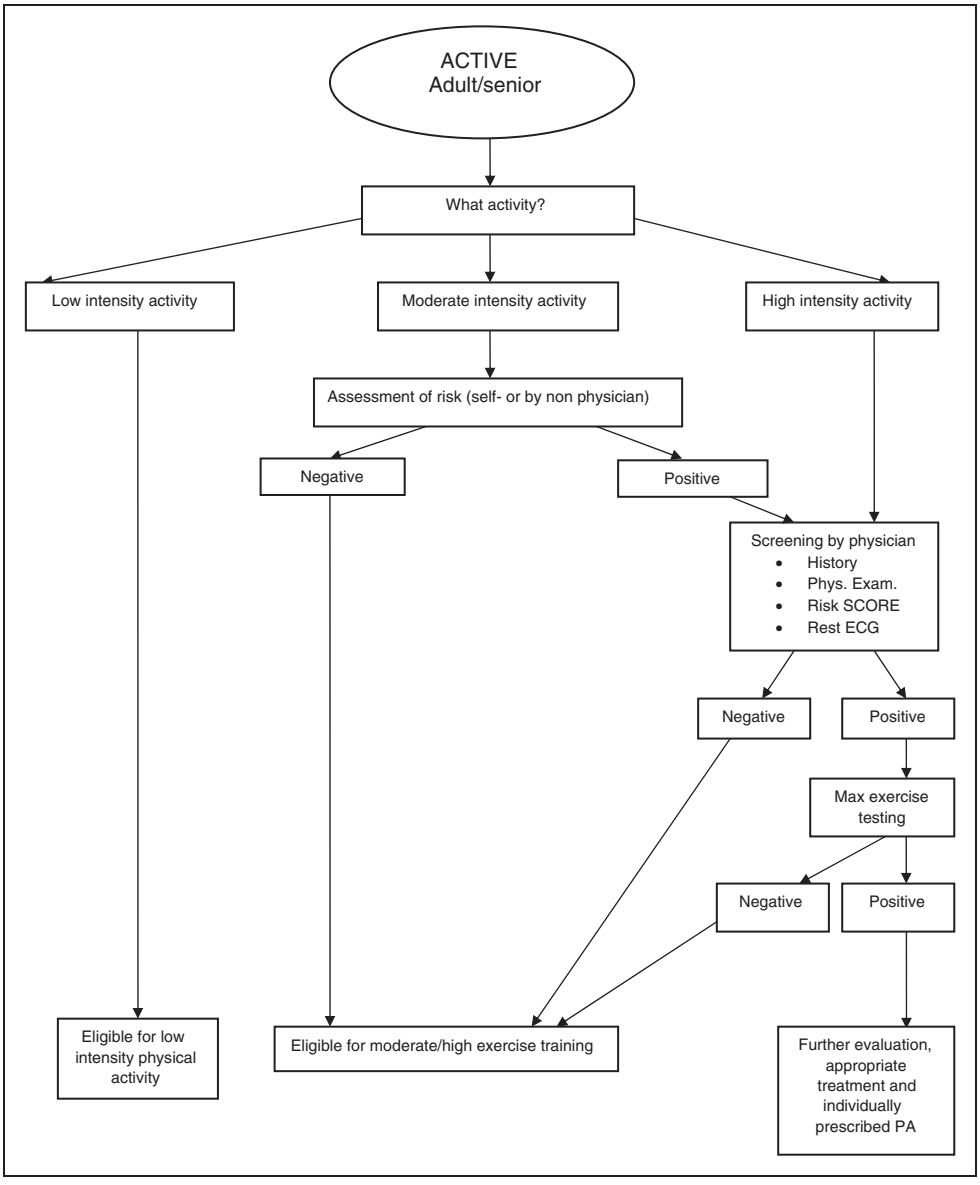


Figure 3. Proposed pre-participation evaluation protocol for asymptomatic active adult/senior individuals. PA, physical activity.

or decreased functional capacity, further evaluation by a cardiologist is necessary. Eligibility for further exercise training/sports participation in case of confirmed CVD is advocated according to ESC recommendations.[36]

Moderate/high-intensity activity

Sedentary adults, aged above 35 years, who intend to participate in moderate (3–6 METS) and high-intensity (>6 METS) exercise should be evaluated by appropriate health care professionals/clinicians using personal and family history, risk SCORE, physical examination (including checks for Marfan's syndrome, cardiac auscultation, measurement of blood pressure in both arms and palpation of peripheral pulses) and a 12-lead ECG.

If the physician-led evaluation is negative, the individual is eligible for low, moderate or even high-intensity PA. For those with a positive screening evaluation, a maximal exercise test is recommended. A positive exercise test result necessitates further evaluation and appropriate management. Those individuals who remain symptom free and with a normal exercise test are eligible for moderate/high-intensity exercise training, but we recommend that cardiovascular evaluation is repeated on an individual basis.

Active individuals (Figure 3)

General comments: Although active individuals, aged above 35 years, have a statistically lower risk for cardiovascular complications during exertion compared with sedentary individuals; physicians should be cautious when active individuals show a marked decrease in exercise performance,[4] because sudden changes in the level of PA have been associated with an increased risk of cardiac events, especially in males.[58]

Low-intensity activity

Active adults, aged above 35 years, who are already engaged in low-intensity activity and asymptomatic, do not require cardiovascular evaluation, unless there is development of symptoms or unexplained reduction in physical fitness.

Moderate/high-intensity activity

Active adults, willing to participate in moderate-intensity (3-6 METS) PA, should be evaluated by self-assessment questionnaires, as described above.

Individuals with symptoms or history of CVD, derived from self-assessed questionnaire, should be evaluated by a physician including reassessment of the personal and family history, physical examination, risk SCORE and 12-lead resting ECG.

All active individuals contemplating or engaged in high-intensity (>6 METS) activity (Figure 3) are subject to detailed evaluation by a qualified physician even in the absence of symptoms or risk factors for CAD.

Indeed, adult/senior active individuals identified with a positive (abnormal) evaluation by the qualified physician should undergo additional maximal exercise testing. Individuals are eligible for moderate/high-intensity exercise training if the exercise test is normal. In the event of a positive exercise test, further evaluation is necessary to confirm/refute the presence of CAD or another cardiovascular abnormality, using adequate testing, as described earlier.[37] Even for active individuals a reassessment of the risk factor profile, on an individual basis, is recommended.

Discussion

Regular PA provides significant health benefits and it is our aspiration to encourage all individuals to increase their PA and physical fitness. Paradoxically, exercise may also be associated with SCD in those individuals with underlying cardiac disease and this risk is higher in middle-aged and older athletes with CAD. The identification of coronary disease in all middle-aged/older individuals participating in recreational or competitive sporting activity is a controversial issue. The aim of this paper is to provide a pragmatic and practical approach to identifying high-risk individuals to minimize the risk of SCD.

Individual risk profile

The rationale for the recommendations of the consensus panel is that the extent of the cardiovascular evaluation depends on the individual risk profile together with the intended level of PA. The scientific basis for individual risk stratification is strong, and the SCORE system is recommended by the ESC for risk stratification in primary and secondary prevention (SCORE).[18] The fitness level has been shown to predict future cardiac events and overall mortality in several studies, as recently summarized in a large meta-analysis,[7,8] and the habitual PA level has also been associated with cardiovascular events.[2,5,6,59] At present, the level of habitual PA or physical fitness is not included in the SCORE-system, although studies have shown the added predictive value of fitness measures to the SCORE.[53] There have been recent suggestions indicating that future risk stratification for CVD should include both traditional risk factors for CAD

(SCORE) and the individual's fitness level as determined in clinical practice[8]. There is also evidence that the relative risk of cardiac events because of underlying CAD is positively associated with the intensity levels of PA.[23,60]

Self assessment

As we are considering a large population of adult/senior individuals willing to participate in PA, it is not feasible to recommend initial 'physician-based' cardiovascular evaluation for all individuals. Apart from obvious logistical difficulties, this approach may potentially counteract the overall intention of encouraging a more physically active lifestyle in the population.

As a practical approach, these recommendations propose that the risk stratification is initially derived through a self-completed or a nonphysician-assisted health questionnaire relating to symptoms, risk factors for CAD, relevant cardiac history and habitual exercise level.

The second step of risk profiling is recommended for (i) sedentary persons considering or contemplating participation in moderate-to-high intensity activity or having a self-assessed positive risk profile, (ii) active individuals aiming for moderate activity with a self-assessed positive risk profile and (iii) active individuals willing to perform high-intensity activities. This step incorporating further risk stratification/evaluation should be performed by a qualified physician, thereby concentrating the physician's efforts towards the group of individuals with a higher risk of events during PA.

Furthermore, these recommendations do not consider only the individual risk profile but also the intended intensity of activities. It is known that high-intensity exercise conveys a higher risk for SCD.[23] Several factors that could potentially trigger myocardial ischemia, arrhythmias and plaque rupture are specifically related to the increased intensity of PA and sports activities,[24,25] likely mediated through activation of the sympathetic nervous system.[21,27,28,61]

Comparison with other recommendations

Existing recommendations from the AHA/American College of Sport Medicine on cardiovascular screening of persons enlisting for training at health/fitness facilities were published in 1998.[39] These recommendations also indicate the use of screening questionnaires to identify risk individuals, in need of further evaluation before increasing the PA level. The US recommendations differ from our European recommendations, in that habitual exercise was not considered part of the risk stratification process. Similarly, further evaluation by the physician is needed for final risk stratification in all instances when cardiovascular risk profile turns out to be positive at preliminary self assessment.

The AHA science advisory committee recommends pre-participation screening for master athletes (defined as >40 years old).[38,40,41] These recommendations encompass only competitive athletes, and advocates mandatory preparticipation evaluation (history and physical examination) of all master athletes, and maximal exercise testing of all men above 40 years (women >50) with one additional risk factor and those with symptoms, as well as all master athletes above 65 years of age, regardless of risk factors or symptoms.[38,40,41]

Our recommendations apply to all adult/senior non-professional active or sedentary individuals (willing to be) engaged in leisure-time PA/sports activities. However, we do selectively recommend thorough medical evaluation in individuals with higher risk of CAD according to SCORE.[37] Other European recommendations for individuals with several underlying cardiovascular abnormalities[37,62–67] have been published in recent years.

The limitations of exercise testing in asymptomatic individuals

For individuals considered to have a higher risk for cardiovascular events, a maximal exercise test is recommended with view of confirming or refuting the presence of CAD. The exercise test should be conducted until volitional fatigue (or a clinical indication for stopping). An orientation to the theoretical heart rate $(HR)_{max}$, for example reaching at least 85% of the HR_{max}, may be misleading because of individual variations of HR_{max} not related to age. Although the routine use of maximal exercise ECG in healthy asymptomatic individuals with a low risk of cardiovascular events, has low positive predictive value,[37,38,68] in populations with risk factors for CAD, a positive exercise test has been shown to identify individuals with an increased risk of subsequent coronary events.[69,70] Indeed, in the Seattle Heart Watch Study, asymptomatic men with more than one coronary risk factor and more than two abnormal findings on the exercise test, had a 30 times higher risk for cardiac events during the 5-year follow-up period.[71] A recent publication indicates that the exercise test may be superior to the resting ECG at identifying underlying cardiovascular abnormalities.[72] However, these recommendations concede the fact that an exercise ECG may be associated with a substantial number of false-positive and false-negative results,[73] especially in asymptomatic individuals.[74,75] Consequently, myocardial stress scintigraphy or stress echocardiography (especially in women) may

be recommended to partially avoid or reduce such pitfalls in selected equivocal clinical cases. Physicians should also take into account the absolute age-related and body weight-related peak exercise capacity during a treadmill test, as it is a predictor of mortality, both in normal men and those with CVD.[76,77] In fact, cardiorespiratory fitness data provide additional prognostic information to the SCORE system in relation to risk of mortality.[53]

In middle-aged/older individuals willing to increase the level of habitual PA, an exercise test serves two purposes: notably the identification of CAD and also the determination of the functional capacity of the individual, which will prove helpful in facilitating the individual's exercise prescription. The implementation of an exercise test supplies individuals with adequate and personalized recommendations for an appropriate training intensity.[74] As an additional benefit this may have a positive influence on the compliance to exercise by adding realistic advice and efficiency for the exercise program and by more accurately quantifying the training effect.

Conclusion

Regular PA will have an increasing importance in the future as a counter measure to life style-related disease, particularly in adult/senior individuals. Health care systems have a responsibility to recommend increased PA by minimizing risks and maximizing benefits. As intense and vigorous PA and a high individual risk profile is associated with increased risk of SCD, it is essential to take these factors into consideration, when recommending appropriate evaluation of adult/senior individuals willing to engage in PA and sports.

Self assessment of the habitual PA level and of the risk factors is recommended for screening of large populations. Individuals deemed to be at risk require further evaluation by a qualified physician. In senior/adult individuals with an increased risk for coronary events, maximal exercise testing (and possibly further evaluations) is advocated. Apart from aiding the detection of CAD, the exercise test should provide additional important information relating to the individual fitness level. Hopefully, the recommendations in this paper provide a practical solution for facilitating safe exercise prescription in senior/adults.

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