



Opinion paper: Exercise for healthy aging

Risto U. Erkkola ^{a,*}, Tommi Vasankari ^b, Riku A. Erkkola ^c

^a Department of Obstetrics and Gynecology, University Central Hospital, Turku, Finland

^b UKK Institute Tampere, Finland

^c Department of Obstetrics and Gynecology, South Karelia Central Hospital, Lappeenranta, Finland

ARTICLE INFO

Keywords:

Exercise

Late postmenopausal health

Physical activity

ABSTRACT

The physical demands of daily life in developed countries have decreased remarkably during the last two centuries. General leisure time has increased and the age at retirement has decreased. General health has improved and life expectancy has increased. Most people can expect to live 20–30 years after retirement. By 2050, one in four people in Europe and North America will be aged 65 or over. Furthermore, women live longer than men. Generally, the physical demands on older women will be low. Thus, their physical fitness will decline, which in turn will affect a variety of organ systems and functions, and so impact on mental health, quality of life and independent living. This opinion paper explores exercise strategies for healthy ageing.

1. Introduction

According to the United Nation's World Population Prospects: the 2019 Revision, 8% of the worldwide population is currently over 65 years of age, but this is expected to increase to about 16 % by 2050 [1]. By 2050, 25 % of the population in Europe and North America could be aged 65 or over. The change in the population age profile has several health, social and economic consequences.

In Europe, life expectancy is increasing. In member states of the Organization for Economic Co-operation and Development (OECD), the life expectancy at the age of 65 years is 20–22 years, depending on ethnic background, social situation and gender. The life expectancy of women is generally 3–4 years longer than that of men [2].

Unfortunately, longevity and illness are strongly associated. The health problems increasing with age are largely cardiovascular diseases, malignant neoplasms, type 2 diabetes, chronic respiratory problems, musculoskeletal diseases, falls, neurological and mental disorders [3]. Furthermore, the aging population also suffers from other social threats, such as the loss of the spouse and other age mates and a gradual loss of independence.

The World Health Organization (WHO) has published recommendations to counteract the declines in the physical and psychosocial capacity in older people [4]. With increasing longevity, there is only poor evidence to suggest that these extra years can be lived in good health. Based on Global Burden of Disease study, the rate of years lived with disability increased in both men (7,9%) and women (6,5%) between

1990 and 2017 [5]. Yet in population studies great interindividual diversity in health and functioning is observed in all age groups. This may be a consequence of the cumulative impacts of advantages or disadvantages in people's lives, yet it may also be a consequence of lifestyle.

There is strong scientific evidence that regular physical activity has extensive health benefits for adults aged 65 and above (as is the case, of course, for people aged 18–64). In some cases, the evidence of health benefits is strongest in older adults because the poor outcomes related to inactivity are more common than in younger age groups [6].

Many national health agencies have published guidelines on increased physical activities and exercise in all age groups, including those over 65. They can be easily found online. Their recommendations are largely similar. This article presents some basic concepts on physical fitness and gives goals and guidelines for physical exercise for elderly people.

2. Methods

We conducted an Internet search for published national guidelines. Generally, these guidelines cannot be found in PubMed. We used search terms "exercise", "exercise physiology", "physical activity", "physical training", "aging", "65 years+".

We also looked for the guidelines given by various international organizations, WHO being the most important. The guidelines found are presented in the Appendix to the article. The principles of the recommendations are largely similar. We also reviewed the references in those

* Corresponding author at: Virmuntie 26 as 10, 20540, Turku, Finland.

E-mail address: ristoe34@gmail.com (R.U. Erkkola).

guidelines. We also used the reference bank of the UKK-Institute.

3. Components of health-related physical fitness

Previously, fitness was commonly defined as the capacity of the person to meet the physical demands of daily life and carry out daily activities without undue fatigue. However, because of increased leisure time, changes in lifestyles have rendered this definition insufficient. Today, physical fitness is considered a measure of the body's ability to function effectively in work and leisure activities, to stay in good health, to resist hypokinetic diseases, and to respond in emergencies.

The following five components of physical fitness are health-related. Any program that neglects one or more of these fitness categories and omits the required type of exercise is not going to benefit the body in the long run. An effective fitness program will attempt to improve all five of these components.

3.1. Cardiovascular endurance

Cardiovascular endurance is the ability of the heart and lungs to work together to provide the needed oxygen and fuel to the body during sustained workloads such as walking, jogging, cycling, rowing and swimming. The Cooper 12-min run (walk) is a commonly used field test of cardiovascular endurance.

3.2. Muscular strength

Muscular strength is the amount of force a muscle can produce. The way to increase strength is to train with heavy weights, working in the 4–15 repetition (rep) ranges. The heavier the weight, the fewer reps are required. Examples of the types of exercise are the bench press, leg press or bicep curl. In the field, the person's own body weight can be used, as in the push up test.

3.3. Muscular endurance

Muscular endurance is the ability of the muscles to perform continuously without experiencing fatigue. The way to increase muscular endurance is to train with light weights, working in the 20–25 rep range. Working with lighter weights will train the muscle fibers needed for endurance, and the higher rep range leads to a longer period of exercise. The sit up test, abdominal curls or squatting tests are most often used to test muscular endurance.

3.4. Flexibility

Flexibility refers to the range of motion of each specific joint. Flexibility training ensures that the body can move through its entire range of motion without pain or stiffness. Examples would be stretching individual muscles. The sit-and-reach test is the most commonly used to test flexibility. Connecting hands behind the back is also used.

3.5. Body composition

Body composition is the amount of fat mass compared to lean muscle mass, bone and organs. This can be measured using underwater weighing, skinfold readings, and bioelectrical impedance. Underwater weighing is considered the “gold standard” for body fat measurement, but because of the size and expense of the equipment needed, skinfold measurements are more practical. The average man tends to have about 18–24 % of total weight in the form of body fat, while the average woman has 25–31 %.

4. Components of skill-related fitness

The above-mentioned components of health-related fitness enable

one to become and stay physically healthy. In physical fitness skill-related categories also enhance one's physical performance. Six different categories of skill-related fitness are shown below. Different testing batteries have been developed for these skills. For instance, a person is required to perform each activity as many times as possible in 30 s. A special advantage is that all these skill-related components can be trained at home or outdoors.

4.1. Agility

Agility is the ability to change and control the direction and position of the body while maintaining a constant, rapid motion. Examples for training may be throwing and catching a ball; this can be made more demanding by changing the direction of the throw.

4.2. Balance

Balance is the ability to control or stabilize the body both at standstill and in movement. This remains one of the most important skill-related components of fitness at advanced age. Excellent balance can help prevent falls and fractures. Dancing is an excellent method to train balance skills.

4.3. Coordination

Coordination is the ability to use the senses such as sight and hearing together with body parts during movement. This skill is required in alpine skiing, volley ball, golf, croquet and even when throwing darts. Using hands and eyes together is called hand-eye coordination.

4.4. Speed

Speed is the ability to move the body or parts swiftly. Many sports rely on speed to gain advantage over the opponent. Good examples are tennis, badminton, baseball, soft ball and football.

4.5. Power

Power is the ability to move different parts of the body while applying the maximum force of the muscles. Power is a combination of both muscular strength and speed. It can be trained with weights, elastic bands, and at home by using the person's own body weight for resistance.

4.6. Reaction time

Reaction time is the ability to respond quickly to what you hear, see, or feel. Hand clapping with an opponent is an excellent training method even at very advanced ages.

5. Changes in physical fitness with increasing age

Many physiological changes occur with aging [6,7]. During later middle age (45–64 years), women reach the menopause. The decline in physical condition generally continues but it may be accelerated by low amounts of physical activity and high amounts of sedentary behavior. In early old age (65–74 years), there may be a modest increase in physical activity, in an attempt to fill free time after retirement. By middle old age (75–85 years), many people have developed some physical disability, and in the final stage (very old age, over 85 years) people tend to become more dependent on outside help. There are nevertheless wide inter-individual differences in functional status at any given chronological age. In terms of maximal oxygen intake, muscle strength and flexibility, the best-preserved 65-year-old may outperform a sedentary 25-year-old.

In the **cardiovascular system** there is a 20–30% decrease in cardiac

output from about 20 years of age through to the age of 65. Maximal oxygen capacity is present at around 20 years of age. In males the average is 48 mL O₂/kg/min and in women 38 mL O₂/kg/min. From 20–80 years of age, it decreases approximately 10–15 % per decade for sedentary men and women, respectively [5,6]. The classical equation for the maximum heart rate (peak rate = 220 - age in years) implies a maximum of about 155 beats/min at age of 65 years. Hence, maximum heart rate decreases approximately 10 beats/min per decade, although resting heart rate shows little alteration with age. However, a well-motivated and trained 65-year-old can attain a rate of 170 beats/min or more.

It should be noted that with aging there is an increase in the prevalence of atrial fibrillation in the general population, from 0.12–0.16 % in people younger than 49 years to 3.7–4.2 % in those aged 60–70 years. Beyond the age of 80 years, the prevalence can be as high as 10–17 % [8]. Atrial fibrillation may reduce cardiac output by 10%–30%. On exercise, those with the condition may rapidly experience fatigue, breathlessness and exercise intolerance. It also makes measuring the heart rate difficult and unreliable.

Changes in **blood pressure** are due to the loss in elasticity of the major blood vessels. Consequently, with aging there may be a 10–40 mmHg elevation in systolic and diastolic blood pressure.

The **respiratory system** undergoes a 40–50% loss in forced vital lung capacity (total volume of air that can be voluntarily moved in one breath) by the age 70. There is also a decrease in chest wall compliance, maximum ventilation and alveolar size.

Nerve conduction is reduced by up to 15 % by age 60. It is concomitant with a reduction in number of neurons and brain mass. Furthermore, a certain percentage of elderly persons may develop either Alzheimer or vascular dementia, which gradually worsens a person's physical and social abilities.

As to the **senses**, there is a loss of certain sensory sensations, such as thirst, eyesight, taste, balance, and hearing that occur gradually with aging [7].

Hematological and biochemical changes include a fall of hemoglobin, hematocrit as well as red cell mass. There is an increase in the total cholesterol with a decrease in HDL cholesterol.

In postmenopausal women, there is a 2% loss of **bone mass** per year. Degeneration of the joints, through loss of cartilaginous tissue, especially in the spine, is common. Further, connective tissues gradually lose their elasticity, muscle fibers shorten, and joints decrease the production of lubricating synovial fluid.

In terms of **muscular fitness**, strength increases into the third decade of life, then plateaus through the fifth and/or sixth decade, and then declines rapidly. If extreme, this decline is called sarcopenia. The muscular system undergoes a 40 % loss of muscle mass and 30 % decrease in strength by age 70. Muscle weakness, more in the lower limbs than in the upper body, is associated with reduced walking speed, and increased risk of disability and falls. It is not known whether the strength loss is a function of poor use or of plain aging.

All these changes together lead to a reduction of physical abilities, the consequences may include increased dependence on other people, a need for nursing home care and significant declines in personal well-being and social contact.

6. Exercise to improve health and counteract disease

Regular physical activity has many health benefits. Table 1 shows the current view on these [9]. Therefore, in appropriate situations exercise prescription has been developed to replace the writing of a chemical/drug-based prescription.

Recent extensive and updated reviews [10,11] introduce evidence-based indications for prescribing exercise in the treatment of 26 different diseases including:

Table 1

Biological and psychological consequences of regular physical activity [9].

Improved body composition
Improved weight control
Improved coronary blood flow
Improved cardiac function
Improved endothelial function
Improved high density lipoprotein cholesterol
Improved glucose metabolism
Improved insulin sensitivity
Improved autonomic nervous system tone
Improved psychological well-being
Reduced blood pressure
Reduced systemic inflammation
Reduced blood coagulation
Reduced abdominal adiposity
Reduced triglyceride levels
Reduced low-density lipoprotein cholesterol
Reduced stress, anxiety and depression

- 1 psychiatric diseases and conditions (depression, anxiety, stress, schizophrenia);
- 2 neurological diseases (dementia, Parkinson's disease, multiple sclerosis);
- 3 metabolic diseases (obesity, hyperlipidemia, metabolic syndrome, polycystic ovarian syndrome, type 2 diabetes, type 1 diabetes);
- 4 cardiovascular diseases (hypertension, coronary heart disease, heart failure, cerebral apoplexy, and intermittent claudication);
- 5 pulmonary diseases (chronic obstructive pulmonary disease, asthma, cystic fibrosis);
- 6 musculoskeletal disorders (osteoarthritis, osteoporosis, back pain, rheumatoid arthritis)
- 7 some forms of cancer (endometrial and breast cancer)

For that up-to date review, a literature search of Cochrane and other meta-analyses was carried out for each disease category. The literature was searched by examining reference lists in original articles and reviews. Studies were included in which the intervention was aerobic or strength exercise, and priority was given to randomized controlled trials (RCTs). The effect of exercise therapy on disease pathogenesis and symptoms are given and the possible mechanisms of action are discussed. Further, for each disease, a recommendation is given regarding the optimal type and dose for the prescription of exercise.

6.1. Exercise and obesity

Body composition is one of the health-related components of physical fitness, and relates to the amount of fat mass compared to lean muscle mass, bone and organs. It can also be described by using the concept of body mass index (BMI). The BMI is defined as the body mass divided by the square of height, and is universally expressed in units of kg/m² (mass in kilograms and height in meters). Overweight (BMI 25–29.9), obesity (BMI 30–39.9) and severe obesity (BMI 40+) are a worldwide health problem. Yet, BMI cannot be used to diagnose obesity because people who are very muscular can have a high BMI without much fat. Nevertheless, in the great majority of cases a high BMI indicates obesity. Generally, women with a waist size of 80 cm or more are more likely to develop obesity-related health problems. The main health problems caused by obesity are type 2 diabetes, coronary heart disease, stroke and hypertension.

It seems that exercise alone is not sufficient to produce meaningful weight loss, but combining dieting and exercise provides the greatest health benefits and weight loss in the long term. Dieting generally means a 4–6 MJ (1000–1500 kcal) energy intake/day; this may be very difficult to reach for many people.

To lose weight, a person has to burn more calories than they are taking in. However, it requires 3–4 h a week with vigorous exercise (intensity 60–80 %) to start effectively losing weight. Further, with

training, the body composition is changing by losing fat and gaining more lean weight. Hence, dieting is probably 4 times more important for losing weight than exercise [10,12]. The change in body composition is, of course, of very beneficial in terms of health.

6.2. Exercise and breast cancer

Studies strongly suggest that exercise may diminish the risk of breast cancer, also in postmenopausal women. In a meta-analysis of 19 cohort studies and 29 case-control studies, an inverse association was observed between physical activity and postmenopausal breast cancer, with risk reductions ranging from 20 % to 80 % [13].

7. Difference between physical activity and exercise

Physical activity refers to any movement of the body that uses energy. This means daily activities such as vacuum cleaning, gardening, or walking up and down the stairs. However, physical activity also includes exercise activities like running or swimming. Hence, physical activity can range from light to vigorous intensity.

Exercise refers to planned, structured, and repetitive movement with a goal of retaining or improving physical fitness. It can be personally planned and conducted, or it may be planned and organized by public or private actors. While some exercises can be of light intensity, most are usually moderate to vigorous intensity.

8. Intensity of physical training

The intensity of physical exercise can be assessed in many ways. This article attempts to be practical. The first assessment method is based on the increase in heart rate, and the second is based on estimated energy consumption.

The Finnish professor in occupational health Martti Karvonen developed in the 1950s a formula to determine a target heart rate (HR) for aerobic activity. Generally, the maximum HR a person can achieve is 220 bpm less their chronological age. In the Karvonen formula, peak HR is the maximum HR achieved during exercise stress testing and K is the intensity coefficient: target HR = (peak HR - resting HR) × K. In a study published in 1957, Karvonen examined the effect of different training intensities at rest, work, and maximum HRs [14]. The training at an intense level (60–80 % of the maximum) will gradually lead to a decrease in working HR, which is an indication of increasing peak oxygen consumption and improving cardiorespiratory fitness. The threshold at which improvements are seen is 60 % of the HR reserve (HRR), which is expressed as the difference between the peak HR and resting HR (Table 2). This finding was most pragmatic in defining the exercise intensity that produced tangible results. Table 3 shows the estimated maximum HRs with increasing age and the HRs and corresponding intensities of physical activity.

The intensity can also be defined as metabolic equivalents (MET) [15]. One MET is defined as the energy consumption/h it takes to sit quietly. For the average adult, this is about 10 kcal/h per every 10 kg of body weight. A person who weighs 70 kg would burn approximately 70 kcal/h while sitting or sleeping.

Table 2

Example of the use of Karvonen Formula for calculating individualized target heart rate (HR) parameters for an exercise with 40 % intensity [12].

Karvonen Formula:

$$\text{Target Heart Rate Intensity Zone} = ((\text{max HR} - \text{resting HR}) \times \% \text{Intensity}) + \text{resting HR}$$

A person performs exercise tolerance test with values as follows:

Maximum HR 160 beats/min, resting HR 60 bpm.

HR reserve (HRR) = max HR – resting HR = 160 – 60 bpm = 100 bpm.

Target HR for a 40 % intensity exercise would be:

$$((\text{max HR} - \text{resting HR}) \times 0.4) + (\text{resting HR}) = (0.4 \times 100) + 60 = 100 \text{ bpm}$$

Table 3

Exercise zones. The intensity of exercise should be at 60–80 % level to improve the physical fitness. The approximate heart rates which are then achieved are shown in the columns for each age group. They may vary depending on the fitness level.

Age (yrs) Efficacy (%)	20	50	60	70	80	90
Theoretical/practical maximum heart rate						
100	200	170	160	150	140	130
VO2 Max (Maximum effort)						
90	180	153	144	135	126	117
Anaerobic (Hardcore training)						
80	160	136	128	120	112	94
Aerobic (Cardio training/Endurance)						
70	140	120	110	100	90	80
Weight control (Fitness/Fat burning)						
60	120	102	96	90	84	78
Moderate activity (Maintenance/Warm up)						
50	100	85	80	75	70	65

Moderate-intensity activities means moving fast enough or strenuously enough to burn off three to six times as much energy per minute when compared to sitting quietly (6 METs).

Vigorous-intensity aerobic activity means breathing hard and fast, and heart rate going up dramatically. At that level, a person wouldn't be able to say more than a few words without pausing for a breath, and might feel uncomfortable. Vigorous-intensity activities burn more than 6 METs.

This type of measurement does not consider the fact that some people have a higher level of fitness than others. Thus, walking at 5 km per hour is considered to require 4 METs and to be a moderate-intensity activity, regardless of who is doing the activity. A brisk walk would likely be an easy activity for well-trained person, but a very hard activity for a sedentary senior citizen, yet the energy cost is close to equal.

Table 4 gives examples of light-, moderate-, and vigorous-intensity activities for healthy adults.

9. Exercise techniques

9.1. Cardiovascular training

This is definitely the most important method of exercise. The heart has to be able to circulate blood and to provide the needed oxygen and fuel to the body during sustained workloads. The well-known cardiovascular training methods have to raise the heart rate: examples are walking, jogging, cycling, rowing and swimming. In countries with severe winters, cross-country skiing and skating are very popular exercise methods. Alpine skiing, where possible, is a good training mode. In the summertime, roller skating and roller skiing can also be practiced.

Table 4

Examples of light, moderate, and vigorous intensity activities for healthy adults (METs: Metabolic equivalents).

Light <3.0 METs	Moderate 3.0–6.0 METs	Vigorous >6.0 METs
Walking slowly	Brisk walking (6 km/h)	Hiking
Sitting using computer	Heavy homework (washing windows, vacuuming, mopping)	Jogging (15 km/h) Shoveling
Standing at light work (cooking, washing dishes)	Mowing lawn (power mower)	Carrying heavy loads
Fishing sitting	Bicycling with moderate speed (15 km/h)	Bicycling fast 25 km/h Basketball game
Playing a musical instrument	Badminton recreational	Soccer game
	Tennis doubles	Tennis singles

Cardiovascular endurance can be tested in many ways: Cooper 12-min run (walk), or a 6 min walk developed at the UKK Institute are often used for this purpose [16].

In gyms, there are many exercise machines for cardiovascular training. Bicycle ergometers and rowing machines have become very popular. The advantage in using these devices is that the exercise is not weight bearing, which helps in training if there the person is overweight. The same is true with water gymnastics, whereby the training is facilitated by the water supporting the person.

9.2. Muscle training

The muscles of seniors (65 years and above) are adaptable: large improvements can be gained when the muscular system is trained, sometimes preferably under supervision. Progressive resistance training (PRT, including exercise machines, free weights and elastic bands) is an effective intervention to improve strength and the performance of both simple and complex activities. Rough weight lifting may cause injuries, yet these are not adequately reported. In general, the injuries are minor and rapidly cured.

9.3. Nordic walking

There are many reasons to emphasize this method. Nordic walking is fitness walking with specially designed poles. Finnish cross-country ski racers were using the basic concept for summer training already in the 1930s. Nordic walking was first formally defined in 1979. This exercise model is the one of the fastest spreading exercise methods in Europe. In Finland, 1,5 mill sticks have been sold to a population of 5.5 mill.

Nordic walking poles are significantly shorter than those recommended for cross-country skiing. They come in one-piece, non-adjustable shaft versions, available in varying lengths, or as telescoping two- or three-piece twist-locking versions of adjustable length. One-piece poles are generally stronger and lighter, but must be matched to the user. Telescoping poles are 'one size fits all', and are more transportable.

Compared to regular walking, Nordic walking involves applying force to the poles with each stride. Nordic walkers use more of their entire body (with greater intensity) and receive fitness building stimulation not present in normal walking for the chest, broad back muscles, triceps, biceps, shoulder, abdominals, spinal and other core muscles that may result in significant increases in heart rate at a given pace. According to the findings of the research conducted by scientists from various universities, both Nordic walking and conventional walking are beneficial for older adults. However, Nordic walking provides additional benefits, making it suitable for improving aerobic capacity and muscular strength as well as other components of functional fitness in a short period of time. Nordic walking has been estimated to increase energy consumption by 46 % compared with walking without poles. [17,18].

A major benefit is safety. The poles help very efficiently in uphill walk. By having four "legs" on the ground, falls are prevented, especially in downhill walking and walking on slippery, wet or icy terrains. Hence, Nordic walking is an effective and safe mode of exercise to improve overall fitness in older adults.

9.4. Gymnastics and stretching

There are many studies on the regular practice of gymnastics at home or in a group. Recreational gymnastics is a combination of balance, agility and strength training, although not to the same extent or intensity as in gym training or Tai Chi. In Finland, a 20-year follow-up study (from a starting mean age of 62–63 to the end of data collection at the mean age of 81–83 years) was conducted to record falls and fractures. Recreational gymnastics was not specifically planned for falls or fracture prevention but rather for improving general wellness. The group which practiced recreational gymnastics (and some of the participants also took part in folk dancing) had 30 % fewer falls than the sedentary group

[19]. An abridged Cochrane review of 59 RCTs with almost 8000 participants concluded that balance and functional training may reduce falls by 24 %, Tai Chi by 19 %. The review was uncertain about the effects of programs that primarily involve resistance training, dance or walking [20].

On the Internet, there are many models of gymnastics and stretching. It is very difficult to carry out randomized, controlled studies which would be in any way blinded. To create a control group not doing exercises is impossible and unethical. Neither is it possible to prevent dilution of the groups. The only result that can be observed is that with training the test results improve. Further, subjective interview studies suggest that the persons who carry out versatile gymnastics and stretching programs can better maintain their flexibility, strength and agility.

9.5. Dancing, pilates, yoga, tai chi

For training agility, balance and coordination, different dancing techniques present good methods for various levels of exercise. Dancing can be practiced as a single person, in pair dancing and group dancing with various types of music. The technique varies from heavy dancing such as Zumba to conventional pair dancing. Furthermore, the social interaction enhances this type of physical activity. Zumba can also be practiced as a very hard mode of exercise.

Pilates was developed 100 years ago. It improves flexibility, builds strength and develops control of body and endurance. The muscles of the abdomen, back, and hips are trained, and control of breathing and postures will also improve.

Yoga has many similar features to Pilates. It aims to improve flexibility, muscular strength and fitness. It has been practiced and taught for 1000 years on the Indian peninsula. It has also spiritual philosophical roots. As a physical exercise it has several schools and styles. In 2017, a Cochrane review found low- to moderate-certainty evidence that yoga improved back function compared to non-exercise.

Tai Chi was practiced already in the 12th century in Chinese monasteries. It was initially a martial art. There is evidence that it helps in retaining and improving health. It also features meditation. It is an excellent way to practice a soft balance and flexibility exercise with a very low risk of injuries. The ability to concentrate on the movement is the central point.

A Cochrane review from 2011 included 94 studies with 9821 participants [21]. Most participants were women living in their own home. 3 dimensional exercises including dance, yoga and Tai Chi (15 studies) were analyzed. The review concludes that there is weak evidence that some types of exercise (gait, balance, co-ordination and functional tasks; strengthening exercise; 3-dimensional exercises and multiple exercise types) are moderately effective, immediately post intervention, in improving clinical balance outcomes in older people. Such interventions are probably safe.

10. Education

Education of health care providers about the importance of lifelong physical activity should be included in the training and curriculum of all medical personnel. This includes international, national and local health care organizations, which should promote education in the programs of international conferences and national meetings. Medical associations and medical doctors and other health personnel should be available to assist in exercise and sporting activities to help prevent and treat the possible injuries.

Education of the public can be carried out through many channels. The most efficient ways are mass media, television, social media, newspapers, and journals. Health care providers also have a role, for example in producing information about the possibilities on physical activities. Sports clubs and related associations should attract members of the public through advertising.

In Finland, the UKK Institute - Centre for Health Promoting Research was founded in 1980 and carries the name of the longest-serving President of Finland, President U.K. Kekkonen. The Institute has recently published its up-to-date version of Exercise Recommendations for elderly people (Fig. 1) [22].

Because of the current Covid-19 pandemic, almost all public, community-based training in outdoor and indoor sites may be greatly limited. Moreover, many private gyms are closed or have radically restricted their activities. Still, cities and communities should be informed about alternative possibilities. The appeal of nature, forests and beaches should not be forgotten. Opinion leaders have an important role here.

11. Motivation

Research organizations should extensively publicize new findings in this area. A good example is the association of daily step count with a decrease in all-cause mortality in a population of almost 5000 persons with mean age of 57 years over a 10-year follow-up. Those who took 8000 steps a day had a 51 % lower all-cause mortality rate than those who took only 4000 steps a day [23]. In the group which took 12,000

steps a day, the mortality rate was even 65 % lower. Step intensity did not affect the mortality rate.

Communities and public sector bodies should spread information about organized training events, especially low-threshold events for beginners. Professional trainers should show a large variety of techniques, which should be individually adjusted to the person's exercise abilities and skills. Special groups should be invited; an example is the guidance on exercises to rehabilitate patients with cerebrovascular attacks, neurological disease or patients who have had heart attacks. Communities should also price training sessions to be affordable to elderly consumers.

At the time of writing (July 2020), the most mass sporting events have been cancelled due to the pandemic: no city marathons, no mass runs, no mass gymnastics on the play fields. Still, single citizens and families can continue their activities. Hikes in national parks are in some places still available.

Industry manufactures many devices which may stimulate physical activities. Step counters are very useful. There are also smart watches, even smart rings, which can measure almost anything: trekking distances, speed, heart rate, energy consumption, quality of sleep, music production etc. A person does not need these to be able to start and

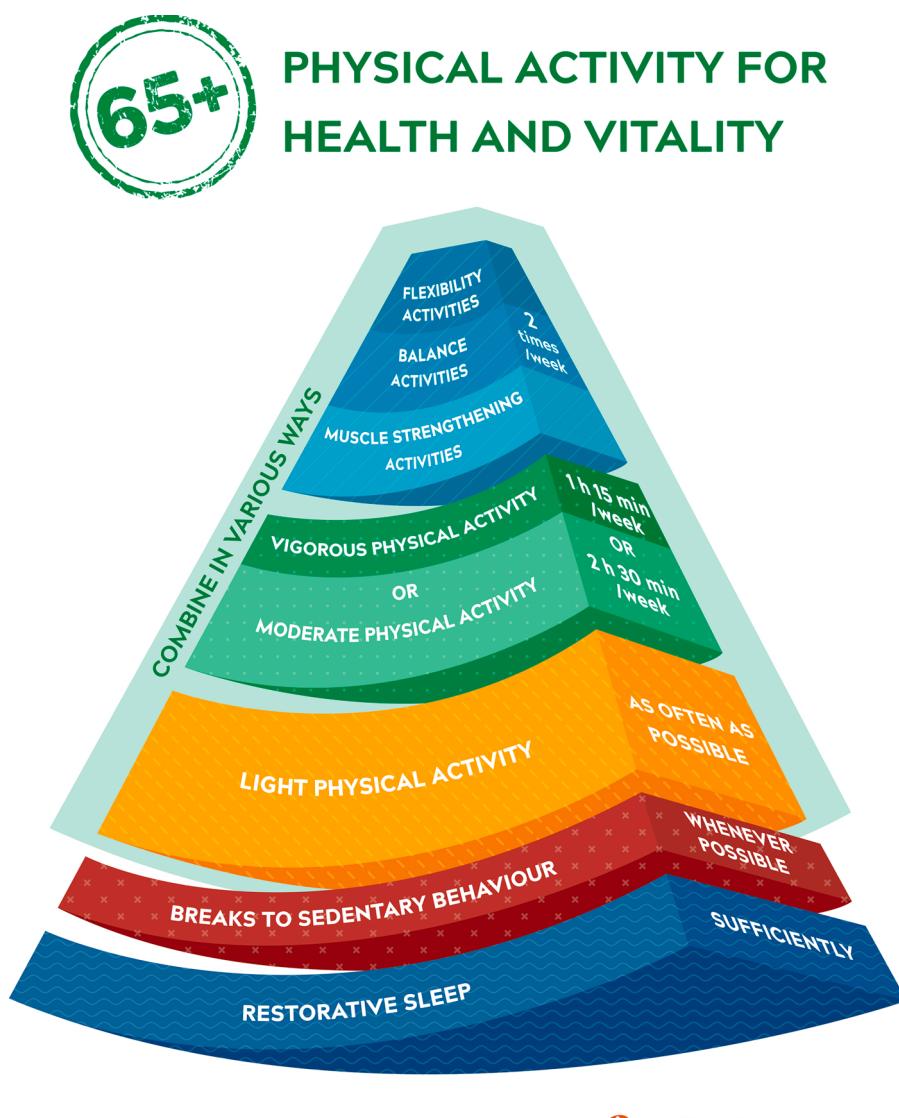


Fig. 1. Weekly physical activity recommendation for 65-year and over adults. (With the permission by UKK-Institute, Tampere, Finland. ukkinstituutti.fi/en).

continue physical activities. For some people they might be of great interest, because they help them to keep exercise diaries. They might also be of some assistance to better aging and health.

12. Conclusion

Many national health agencies have published recommendations on the types and amounts of physical activity and exercise for adults. Older adults should do multicomponent physical activity that includes balance training as well as aerobic and muscle-strengthening activities. Although regular exercise programs are widely promoted in health information and the mass media, recommendations are not necessarily adopted. Gynecologists meet a large number of women on a regular basis. They should be increasingly familiar with the concept of the exercise prescription and encourage their patients to increase their physical activity according to national and international recommendations. This would potentially reduce the impact of many non-communicable diseases and improve quality of life.

Contributors

Risto U. Erkkola planned the paper and wrote the manuscript.
Tommi Vasankari participated in the writing and provided the figure.

Riku A. Erkkola participated in the writing and literature search.

Conflict of interest

The authors report no declarations of interest.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Provenance and peer review

This article was not commissioned and was externally peer reviewed.

Declaration of Competing Interest

The authors report no declarations of interest.

Appendix A. National recommendations for physical activity and exercise for adults of 65 years and above. WHO recommendations included

Australia: Sims J, Hill K, Hunt S, Haralambous B. 2010. Physical activity recommendations for older Australians. (2010) Australian Journal on Ageing 29:81–87.

<https://doi.org/10.1111/j.1741-6612.2009.00388.x> (Accessed 6 Oct 2020)

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