

2. General recommendations regarding physical activity

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Summary

The total amount of physical activity, a combination of intensity, duration and frequency, is related to various health variables in a so-called dose-response relationship. This chapter describes recommendations on physical activity, both in general and in relation to aerobic fitness, strength and flexibility. The link between physical activity, health and physical capacity is also described, as well as the scientific background of the current recommendations in brief. To facilitate the prescription of physical activity, a strategy is also outlined for the application of the recommendations through the activity pyramid.

A summary of the health-enhancing recommendations:

All individuals should be physically active for a combined minimum of 30 minutes, preferably every day. The intensity should at least be moderate, such as a brisk walk. Additional health effects can be achieved if the daily amount or intensity is increased beyond this. In addition, an updated recommendation from the U.S. also includes strength and flexibility training.

Activity pyramid

To make it easier to prescribe physical activity, the activity pyramid can be an aid (see figure 1). The principle is that the activities further down in the pyramid are done more often and at a lower intensity than the activities higher up. One should accordingly proceed from the pyramid's base to plan which daily activities can be done. Thereafter, an assessment is made of if and when it would be appropriate to expand the activities, or move up the pyramid to achieve additional health benefits, based on the individual's needs,

interests and previous and current experience of physical activity, physical capacity and state of health. Activities higher up in the pyramid also provide improvements in aerobic fitness, strength and flexibility.

Note that in some cases, one must begin further up in the pyramid. Chronic disease and/or an advanced age may have led to such weak muscles that strength training, for instance, may be the type of exercise that must precede other exercise to make walking, one of the pyramid’s “base activities”, possible at all.

Flexibility training should be performed at least 2–3 times per week, such as stretching (10–30 seconds), 4 times per muscle group.

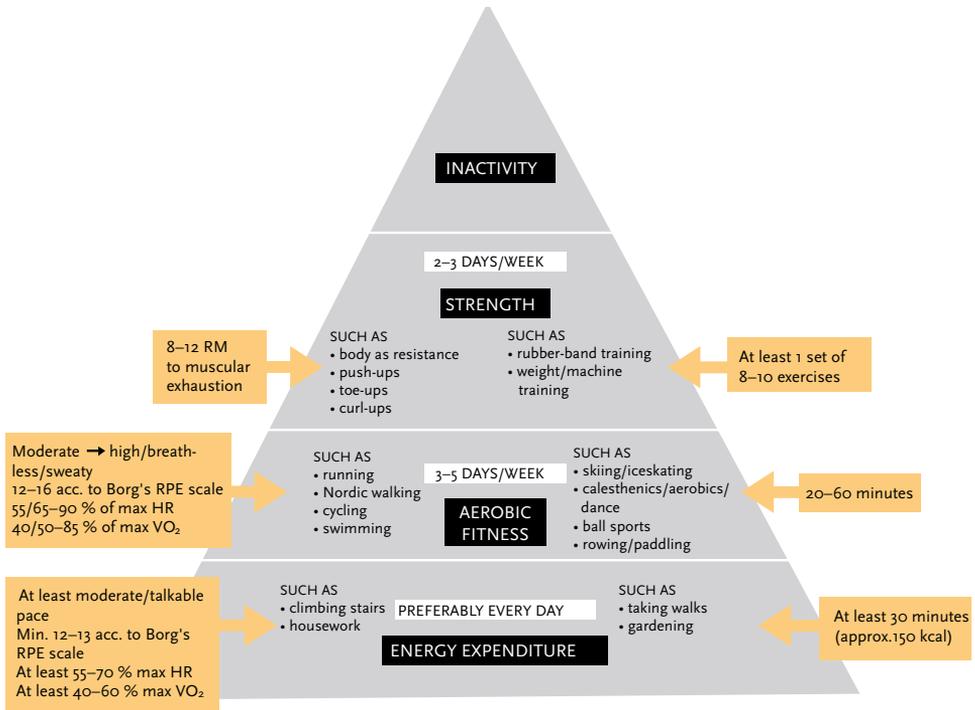


Figure 1. The activity pyramid.

Proceed from the pyramid’s base to plan which daily activities can be done. Thereafter, an assessment should be made of if and when it would be appropriate to expand the activities, or move up the pyramid to achieve additional health benefits, based on the individual’s/patient’s needs, interests and previous and current experience of physical activity, physical capacity and state of health. Activities higher up in the pyramid also provide improvements in aerobic fitness, strength and flexibility.

Note that in some cases, one must begin further up in the pyramid. Chronic disease and/or an advanced age may have led to such weak muscles that strength training, for instance, may be the type of exercise that must precede other exercise to make walking, one of the pyramid’s “base activities”, possible at all. Flexibility training should be performed at least 2–3 times per week, such as stretching (10–30 seconds), 4 times per muscle group. 8–12 RM = the highest load that can be lifted through the entire range of motion 8–12 times.

Health-enhancing recommendations (table 1)

Recommendations for physical activity are based on the knowledge that exists regarding the relationship between physical activity and health. Physical activity has various dimensions such as intensity, duration and frequency. Overall physical activity (a combination of the aforementioned factors) is related to various health variables in a so-called dose-response relationship. This relationship between physical activity and health benefits (risk reduction) appears as a continuum, which does not appear to have any lower boundary. The various health parameters (such as those with regard to osteoporosis, mental illness, obesity and risk factors for cardiovascular disease) probably have different dose-response relationships, but this has not been sufficiently studied. The recommendations for physical activity and expected health effects are also reliant on the starting point, both with regard to activity level and risk profile. This means that the lower the activity level and the worse the risk profile is, the greater the effect can be expected to be if the activity level increases. It has accordingly been shown that the largest health difference is between people that are physically inactive and those that are a little physically active. This means that significant health benefits can be achieved through regular, moderate physical activity.

On behalf of the Swedish National Institute of Public Health, Professional Associations for Physical Activity (YFA) has prepared recommendations on physical activity. The Swedish Society of Medicine's Board adopted the recommendation in September 2000, which is worded as follows:

All individuals should be physically active for a combined minimum of 30 minutes, preferably every day. The intensity should at least be moderate, such as a brisk walk. Additional health effects can be achieved if the daily amount or intensity is increased beyond this. Physically active individuals run half the risk of dying from cardiovascular disease as sedentary persons of the same age. Physical activity also decreases the risk of having high blood pressure, age-related diabetes and colon cancer. Quality of life is also improved by physical activity due to greater mental well-being and better physical health. There is also strong support for physically active individuals having a lower risk of being affected by brittle bones, bone fractures caused by falls, blood clots, obesity and mental disorders. In light of this, all clinically active physicians should advise their patients regarding physical activity adjusted to their state of health and personal lifestyle.

This recommendation is based on a U.S. recommendation published in 1995 (1) by 20 experts in the areas of epidemiology, physiology and medicine. The scientific support structure was further deepened in the report *Physical activity and health. A report of the Surgeon General* (2) and has recently been updated and clarified by the American College of Sports Medicine and the American Heart Association (3). In 2008, this resulted the Physical Activity Guidelines for Americans (27).

In summary, the Physical Activity Guidelines for Americans from 2008 emphasizes that:

1. The intensity should be at least moderate, which means that one is able to talk, but not to sing, i.e. heart rate and breathing will be increased. This type of exercise is denoted as aerobic physical activity in these guidelines.
2. The duration of each exercise session should not be less than 10 minutes. It is not enough to just walk a few minutes back and forth to the parking lot.
3. Exercise of moderate intensity can be replaced by exercise of higher intensity (vigorous intensity). For instance, walking 30 minutes per day can be replaced by running 20–30 minutes, 3–4 times per week. The same amount of energy is expended in these two examples, but in a shorter period of time in the alternative with higher intensity. Consequently, the expected health benefits are considered to be the same.
4. The goals are set per week instead of per day – 150 minutes of brisk walking per week (moderate intensity) or 75 minutes of running (vigorous intensity). It is also possible to mix these two intensity levels over the week. The activity should be spread throughout the week.
5. Everyone is recommended to do strength training and flexibility exercises at least two times per week according to table 2.
6. Balance training is important for the elderly.
7. Children need at least 60 minutes per day of moderate to vigorous activity.
8. More health benefits are achieved if the amount of physical activity is increased from 150 to 300 minutes if the intensity is moderate and from 75 to 150 minutes if the intensity is vigorous.

As previously mentioned, the health-enhancing recommendations are based on a dose-response relationship between the amount of physical activity (the product of intensity, duration and frequency) on the one hand and morbidity and death from cardiovascular disease or diabetes on the other (1, 2, 5–7). The amount of physical activity can be expressed with the help of energy measurements, such as kilocalories (kcal) or kilojoules (kJ). These relationships are based on epidemiological studies, meaning studies at a population level that often include thousands of individuals. The physical activity is, however, self-selected, which may be a weakness in scientific contexts, but there are growing numbers of randomised studies that unequivocally support these epidemiological studies and thereby strengthen the causal relationship between physical activity and disease (8–11). For in-depth reading, see references 12–15.

Recommendations for aerobic fitness, strength and flexibility (table 2)

The American College of Sports Medicine (ACSM) published the first version concerning aerobic fitness training in 1978. In the second version from 1990, strength and flexibility training were also included. The latest and third version from 1998 (16) regarding aerobic fitness, strength and flexibility is somewhat modified and compares the

recommendations concerning aerobic fitness, strength and flexibility with the “health-enhancing” recommendations.

In contrast to the health-enhancing recommendations, recommendations for aerobic fitness and strength are based on a dose-response relationship between the exercise intensity, duration or frequency on one hand and measurements of aerobic fitness, such as maximal oxygen uptake or measurements of strength, on the other. These relationships are most often obtained through experimental studies on significantly fewer individuals than in the epidemiological studies. *Note that the training of aerobic fitness and strength also leads to improved health in addition to providing specific effects in the form of improved physical capacity.*

What distinguishes and merges the current recommendations?

1. Target group

The health-enhancing recommendations address *everyone* while the ACSM recommendations regarding the training of physical capacity are limited to *healthy adult individuals*. This is because the intensity requirement is higher for the recommendations regarding physical capacity and consequently, the risks of negative effects also increase, particularly for individuals with chronic diseases. Special recommendations are therefore needed for these groups and individuals, which are presented in the various sections of FYSS.

2. Intensity

According to the *health-enhancing recommendations*, *intensity can be either moderate or more intense* to achieve positive health effects. Consequently, intensity is not directly decisive to the health effect, but rather the total energy expenditure seems to be more significant to the effect. However, with moderate intensity, the duration must be longer than with a higher intensity to achieve similar health effects (3, 5–7). However, at higher intensity, one should keep in mind that the body needs to recover for the optimal effect of the exercise, meaning that days of rest should be included.

In terms of *improving aerobic fitness and strength*, *a certain intensity must be achieved* to obtain optimal effects, an intensity that is higher than moderate for the majority of individuals (16).

3. Duration

According to the health-enhancing recommendations, the *duration* is given as “a combined minimum of 30 minutes” and the frequency as “preferably every day”. Combined means that one can accumulate activity over the day, such as three bouts of 10 minutes each. This is based on the fact that the activities mapped out in the major epidemiological studies, on

which the recommendations are based, may have been carried out intermittently during the day. Examples of such activities include climbing stairs, walking to and from work, and household and gardening work. However, in the latest U.S. recommendations, it has been established that the activity sessions should not be shorter than 10 minutes each (3, 4, 27).

The minimum amount given as 30 minutes of daily physical activity corresponds to a daily energy expenditure of approximately 150 kcal per day or approximately 1,000 kcal per week. The selection of 30 minutes (150 kcal) is based on studies in which it was found that the risk of premature death was already reduced at 70 kcal per day, but that the risk decreased further if energy expenditure amounted to approximately 150 kcal per day (17–19). The high frequency, meaning “preferably every day”, is significant to a high accumulated energy expenditure over time and to be able to “use” everyday activities at the same time. From a practical perspective, it is easier to incorporate physical activity in daily activities if everyday activities in particular can be used.

In the recommendations for aerobic fitness and strength in the latest version from 1998, the modification was introduced that aerobic exercise (20–60 minutes, 3–5 times per week) can be divided into several sessions during the day, although a minimum of 10 minutes per session. Experimental studies regarding the effect on maximal oxygen uptake support this modification (20–22).

The lower recommended frequency for the training of aerobic fitness and strength than in the health-enhancing recommendations, 3–5 times per week for aerobic fitness and 2–3 times per week for strength, is due to the body requiring periods of recovery for the exercise to have an optimal effect in exercise with higher intensity. In addition, the risk for strain injuries increases if the frequency is too high in aerobic and strength exercise.

4. The recommendations are “merged”

As previously mentioned, the intensity is different between both of the recommendations. The health-enhancing recommendations say that the intensity should be “at least moderate” to achieve health effects, an intensity that is too low to effectively improve aerobic fitness and strength for most individuals (table 2). However, the health-enhancing recommendations state that “additional health effects” beyond those achieved with, for example, a 30-minute brisk daily walk (moderate intensity), can be achieved if the amount and/or intensity are/is increased. If one opts to increase intensity, the two recommendations are “merged”, meaning that a more *high-intensity activity can provide both health benefits and greater aerobic fitness/strength* (3, 4, 27). This is on condition that the chosen intensity is not so high that the duration is extremely short and the energy expenditure is thereby below that which corresponds to a 30-minute brisk daily walk, or approximately 150 kcal per day. However, at higher intensity, the risks of cardiovascular complications increase (23). It should be noted that in regular exercise, the total risk across the day is reduced in terms of the risk of having a cardiovascular complication, although the risk during the actual exercise session is elevated (23). However, the increased risk in connection with a single exercise session appears to be lower for women than for men (24).

Table 1. Health-enhancing recommendation (1-4, Swedish Society of Medicine).

	Frequency	Intensity/load	Duration
Energy expenditure	Preferably every day	At least 55–70% of max HR* At least 40–60% of max VO ₂ ** At least 12–13 as per Borg's RPE scale*** At least a "talkable" pace	At least 30 min.

* Max HR = maximal heart rate.

** Max VO₂ = maximal oxygen uptake.

*** RPE = Borg's ratings of perceived exertion, scale 6–20 (25).

Table 2. Recommendations for aerobic fitness, strength and flexibility (3, 4, 16, 26).

	Frequency (days/week)	Intensity/load	Duration
Aerobic fitness training	3–5	55/65–90% of max HR* (40/50–85% max VO ₂ **) 12–16 according to Borg's RPE scale*** moderate → high/breathless/sweaty	20–60 min.
Strength training	2–3	8–12 RM**** (75% of 1 RM) Borg's RPE scale >16	At least 1 set of 8–10 exercises
Flexibility	2–3		(10–30 seconds) 4 times/muscle group

* Max HR = maximal heart rate.

** Max VO₂ = maximal oxygen uptake.

*** RPE = Borg's ratings of perceived exertion, scale 6–20 (25).

**** RM = repetition maximum. 1 RM corresponds to the highest load that can be lifted through the entire range of motion just once.

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