Physical Activity Recommendations

A Focus On Attainable Behaviors

A central tenant of organizational health literacy is that you need to tell people what you want them to do. But how do we do that when there is such variation in the way physical activity relates to particular aspects of health? If there is no one thing that works in all situations, what should we do.

Topics: Physical Activity Guidelines for Americans — Physical Activity Guidelines for American Children — Physical Activity Guidelines for American Adults — Safety Concerns — 10,000 Steps — Canadian 24 hour Movement Guidelines

Physical Activity Guidelines for Americans

Starting in 2008, the U.S. Department of Health and Human Services publishes Physical Activity Guidelines for Americans to provide information and guidance to policymakers, health professionals, and members of the public on the types and amounts of physical activity that provide substantial health benefits. Now on it's second edition, the guidelines have been revised to reflect evidence–based practices with the express goal of providing **general purpose recommendations that broadly support enhanced health and wellness**. The difficulty, however, is that the evidence–base surrounding such benefits of physical activity often point to more nuanced approaches for implementation, ways of approaching physical activity, and note specific criteria for consideration of activity — such as only how physical activity may best be implemented for osteoporosis prevention.

From a scientific standpoint, these nuances are critical for understanding why physical activity might impact upon particular disease states (such as what we previously discussed regarding issues such as heart failure, congestive heart failure, COPD, osteoporosis, and sarcopenia). And fundamentally, if the recommendations do not activate the necessary mechanisms to address the disease/disorder then no benefit should be expected. Thus, there remains debate about the veracity of such broad–base general purpose recommendations for any given disease/disorder, with discussion over not only how much physical activity is necessary but also how that physical activity is engaged in. But this level of nuance is problematic from a public health standpoint as the general public simply has insufficient health literacy to understand.

The decision to put forth such general recommendations stemmed from the evidence that the vast majority of the US population is inactive. As a result, much of the population may not have the physical capacity or willingness to engage in the more specific aspects — and often more intense levels — of physical activity necessary to address particular disease/disorder states. **It is better to provide a lower, more attainable goal that sets the general public on the right path**. Finally, as more modern evidence for why physical activity may be beneficial has begun to challenge popular conceptions and understandings of disease/disorder states; the idea is that the public might be confused about or reject recommendations which conflict with their prior beliefs but may be more willing to accept generalized recommendations. However, the recommendations do provide more specific guidance based upon particular groups of the population including preschool-aged children, children and adolescents ages 6 through 17, adults, adults age 65 and older, women during pregnancy and the postpartum period, adults with chronic health conditions, and adults with disabilities.

Recommendations for Children and Adolescents ages 6 through 17

Public health recommendations suggest that children and adolescents should do **60 minutes (one hour) or more of physical activity on a daily basis**. **Most of the time spent physically active should be in aerobic activities of a moderate or vigorous intensity, but at least three days per week should include vigorous intensity activity**. **Muscle and bone strengthening activities should be included at least three days a week**. The idea that children as young as six should engage in muscle strengthening activities stands in contrast to popular claims and beliefs particularly common within US society. This recommendation, however, is not saying that young children should engage in power–lifting activities or slinging metal plates in the gym — as these are very likely problematic in a number of ways. Rather, consider that in the context of play–related activities young children often pick up other children who can be nearly double their body weight and jump off play structures well above their height. Such activities place considerable strain upon muscle and bone that can serve as a stimulus to help foster adaptions to strengthen muscle and bone. So these recommendations are simply reflecting the importance of providing opportunities for muscle and bone strengthening activities in an age–appropriate manner. However, muscle strengthening programs are safe for children if they are properly prescribed and supervised.

The particular activities that are made available to children and adolescents should ultimately also offer variety and be enjoyable. This enhances skill development, reduces the risk of overuse injuries, and increases the likelihood of continuing to be active as they get older. It is also important to know that the Guidelines take into consideration the natural activity patterns of children. Children often move between short bursts of moderate and vigorous intensity activity and short periods of rest or light intensity activity. Unstructured active play can provide all three types of physical activity, but as children mature social factors may require the use of more structured activity opportunities to facilitate engagement.

Recommendations for Adults

Public health recommendations suggest that adults should engage in **at least 150 minutes (2 hours and 30 minutes) a week of moderate intensity or 75 minutes (1 hour and 15 minutes) a week of vigorous intensity aerobic physical activity, or an equivalent combination of moderate and vigorous intensity aerobic activity**. The idea is that from a metabolic perspective, vigorous intensity activity requires twice the energy expenditure (6.0 METs) of moderate intensity activity (3.0 METs). So 150 minutes of a 3 MET activity is equivalent to 75 minutes of a 6 MET activity. So long as the activity was at least of a moderate intensity, the minutes required of an activity can be reduced as the intensity of the activity increases. Recommendations also suggest that adults should engage in **moderate or vigorous intensity muscle strengthening activities that involve all major muscle groups at least two days a week**. Ultimately, some physical activity is better than none, and adults who participate in any amount of physical activity gain some health benefits.

> So to put that in the context of energy expended in kilocalories, the Metabolic Equivalent of Tasks (MET) can be converted to calories using the following formula.
>
> $$kilocalories = \frac{(MET \times 3.5 \times kg\,of\,mass \times Minutes)}{200}$$
>
> The Physical Activity Guidelines for Americans suggests that an individual weighing 60 kg (132 lb) would need to expend at least 472.5 kilocalories each week:
>
> **150 minutes of Moderate Intensity Activity**
>
> $$kilocalories = \frac{(MET \times 3.5 \times kg\,of\,mass \times Minutes)}{200} = \frac{(3 \times 3.5 \times 60 \times 150)}{200} = 472.5$$
>
> **75 minutes of Vigorous Intensity Activity**
>
> $$kilocalories = \frac{(MET \times 3.5 \times kg\,of\,mass \times Minutes)}{200} = \frac{(6 \times 3.5 \times 60 \times 75)}{200} = 472.5$$

The major criticisms of these public health recommendations surround not only what the recommendations are, but the way in which they are conveyed. Although metabolic equivalents of tasks are conceptually straight forward, there is debate over their use within public health recommendations given the general availability of smartphone devices and equipment that report calories expended. The general public is likely far more familiar with the concept of caloric expenditure than they are metabolic equivalents. There is also criticism of the inconsistency in using daily recommendations in children but weekly recommendations for adults; which is generally considered unnecessarily confusing. Part of the justification for this in adults is that when considered as a daily target it becomes particularly apparent how low the bar has been set to meet these physical activity recommendations.

To meet the recommendations of attaining 150 minutes of moderate intensity activity each week; an adult would only need to engage in 22 minutes of moderate intensity physical activity each day — essentially a third of the activity recommended for children. For an individual weighing 60 kg (132 lb), they would only need to expend 69.3 kilocalories each day to meet the recommendations. A key point that is often misunderstood in this context is that the **recommendations are specific to engaging in repetitive, planned physical activity with a particular goal (i.e., exercise)**. So this recommendation would be in addition to any other types of activity they accumulate throughout the day.

This approach of setting the recommendation based upon exercise activity rather than overall physical activity stands in contrast to the World Health Organization (WHO) framework for classification of physical activity levels. But as a result of similar representation on the US and WHO advisory boards, the World Health Organization guidelines on physical activity and sedentary behavior mirror those of the Physical Activity Guidelines for Americans.

To be considered moderately active on the WHO framework for classification of physical activity levels (different from their physical activity recommendations), an individual would need to achieve a physical activity level (PAL) of at least 1.7. Since PALs take into account overall energy expenditure, it is more difficult to directly match these two approaches up as we would also need to know metabolic rate and the thermic effect of food, as well as any additional non–exercise related physical activity. But for an individual weighing 60 kg (132 lb) with 20% body fat, their estimated metabolic rate would be around 1,104 kcals and if they ate a 2,000 kcal diet they would expend 200 kcals in thermic effects of food.

So if exercise made up a quarter of the physical activity related energy expenditure for that individual $70 \times 4 = 280\ kcals$, their physical activity level would be at $(1104 + 200 + 280)/1104 = 1.4$; PALs below 1.4 are considered to be extremely inactive. They would need to accumulate over 500 kcals of activity outside of exercise behaviors for these physical activity recommendations to get them to an energy expenditure sufficient to be considered moderately active by the WHO. For context, Apple sets the initial overall physical activity goal on their watches to 300 kcals (a PAL for this individual of 1.45).

Recommendations for Safe Physical Activity

Public health recommendations regarding safe physical activity encompass two distinct aspects of safety: 1) **risk of injuries and other adverse events resulting from the activity**, and 2) **risks associated with the context in which the physical activity takes place**. Although it is important to recognize that physical activity has many health benefits and is safe for almost everyone; injuries, adverse events, and issues do occur. Although exceeding recommendations is associated with greater health benefits, **above 300 minutes (5 hours) per week, the benefit per minute decreases and risk of injury increases for adult populations**.

The most common injuries are with the musculoskeletal system, with one musculoskeletal injury occurring for every 1,000 hours of walking and 250 hours of running. But musculoskeletal injuries severe enough to require medical treatment only occur at a rate of approximately one every 5,000 hours of activity; so the vast majority of those musculoskeletal injuries incurred through physical activity do not require medical treatment. A critical point is that **although risk of musculoskeletal injury is relatively low for children in general, as well as adults participating in unorganized leisure time activity; organized sport participation does increase the relative risk of a musculoskeletal injury particularly in instances of sport specialization** (participating in only a single sport for the vast majority of the year).

Another key point is that **greater exercise intensity is associated with higher injury risk**. So although higher intensity activity can enable an individual to meet physical activity recommendations within a shorter period of time; it also places the individual at much greater risk of injury. As such, it is important that the types and intensities of activity be appropriate for the individuals current level of fitness and health. The general recommendation is that most individuals should **start low and go slow**; gradually building up an orthopedic and cardiovascular tolerance to the activity over a period of weeks to months. Progressing too quickly increases the risk of injury and

increases the risk of quitting the activity.

The risks associated with the context in which the physical activity takes place refer to the potential for injury resulting from the environment. The most obvious examples of this relate to choices to utilize reflective clothing and lights when doing outdoor activities in the early morning or evening to increase visibility, wearing appropriate safety gear, and maintaining exercise–related equipment. But the overarching considerations of the risks fall into three major categories: 1) **the places where we choose to be active**, 2) **environmental considerations**, and 3) **the level of supervision necessary**.

Although the physical risks of activity tend to be quite low; there are very real and prominent risks related to the places in which we engage in physical activity. These risks can encompass a wide range of concepts reflecting physical risks of the environment (e.g., playing on particular surfaces; grass vs turf, clay vs concrete, dirt vs gravel). While the use of particular safety equipment or alterations in equipment can reduce the risks; they only do so when used. Beyond this it is also important to acknowledge that this idea of risk also extends to concepts reflecting sociocultural issues. Consider that within most of the US, female runners are encouraged to run with additional self–defense measures, have someone regularly check in to verify their safety, run with a partner/group or large dog, avoid running the same route on a regular basis, and only do so along well–traveled public paths during daylight hours. Similarly, individuals who identify as representing racial, ethnic, or sexual identity subgroups are generally much more cognizant of the places, communities, and ways in which they feel that they can safely engage in activity. The unfortunate reality is that physical activity engagement can provide an opportunity for criminal, malfeasance, and generally problematic behaviors. As a result of these sociocultural issues, some places were people could choose to be active may be particularly problematic and expose the individual to unnecessary risk.

The idea of environmental considerations reflect the risks related to weather conditions. During very hot and humid weather the risk of heat exhaustion/stroke and dehydration rise considerably if proper precautions are not taken. Sporting environments are gradually shifting their awareness of this; moving practices/games to times of the day with lower temperature and less humidity and utilizing proactive cooling strategies to mitigate the potential for heat stress. However, due to misconceptions regarding how adipose tissue is expelled from the body and outdated perspectives on training; there remains a considerable portion of the population who place themselves at unnecessary risk for minimal benefit. It is not just hot/humid weather that is problematic though as environmental considerations also encompass extreme

cold and potential exposure to air pollution which are associated with adverse health outcomes, including asthma attacks and cardiovascular disease-related events. **The general concept is risk can be mitigated by avoiding those times when the risk is the greatest and making sensible choices to alter training/sport schedules**.

The final concept centers on the idea that individuals with chronic health conditions, poor overall health, and even certain mental health risks may require a greater level of supervision in engaging in physical activity. Although engaging in aerobic physical activity may be particularly beneficial for a middle–aged adult male with risk factors for cardiovascular disease; going for an early morning run by themselves represents an exceptionally high risk activity. Should they have a heart attack, there may be no one there to render immediate care (decreasing the likelihood that they will survive the heart attack). Consulting with a professional who can properly advise them regarding the types and amounts of activity appropriate for them; and engaging in the activity in a supervised environment greatly reduces the risk of injuries and adverse events.

10,000 Steps per Day — Recommendation that individuals participate in sufficient physical activity to attain 10,000 steps each day to promote health and wellness.

But if those are the recommendations for physical activity, where does the popular notion of accumulating 10,000 steps per day come from? It is important to keep in mind that step–based physical activity recommendations predate the emergence of modern smartphone/smartwatch devices. As steps are a basic unit of locomotion they provide a relatively easy to understand measure of activity that could be assessed with low cost pedometers (devices that measure the number of steps taken). The notion of accumulating 10,000 steps per day is largely attributed to public health efforts in Japan in the 1960′s that were reinvigorated in the early 2000′s. This was the result of the emergence of exceptionally low cost pedometers that could be widely distributed (McDonalds distributed them in happy meals to combat negative media attention related to obesity) as well as the development of devices such as the Fitbit.

The 10,000 step goal was not set in response to specific evidence of effectiveness relative to health or wellness; but rather was established because it was conceptually easy to remember. However, the energetic cost of walking is generally around 0.03 to 0.04 kcals per step; so an individual who accumulates 10,000 steps would expend around 300 to 400 kcals in physical activity per day. The criticism of this concept is that around 80% of daily steps are at an intensity corresponding to light intensity physical activity; so even if an individual meets their step count goal they may not have done so at an intensity sufficient to meet physical activity recommendations. There are also concerns related to the inability of pedometers to accurately track the intensity of activities, failing to capture certain movements, and inaccurately estimating caloric expenditure as a result of not taking into account the individual's mass and the intensity of walking.

However, the vast majority of devices now use accelerometers which resolve many of those issues particularly when implemented within smart devices that can incorporate measures of weight. As a result of the general ubiquity of the step–count based approach where most people are aware of the target goal and have devices that could track their attainment of the goal; from a public health perspective it is still viewed as an advantageous strategy to **set the general public on the right path towards being more physically active**. Further, some argue expending 300 to 400 kcals per day in physical activity may be more beneficial for health and wellness than 60 to 80 kcals per day in moderate to vigorous exercise–related activity.

Canadian 24–hour Movement Guidelines

In 2016, Canada took a new approach towards physical activity guidelines deviating from the practices of the US and World Health Organization. Instead of focusing on activity by itself, Canada took a 24–hour approach to consider how various types of physical activity, sedentary behavior, and sleep behavior integrated to promote optimal health and wellness. This approach then set recommendations across four categories: **Sweat, Step, Sleep, and Sit**. Similar to past practices, Canada's 24–hour Movement Guidelines provided specific guidance based upon particular groups of the population.

24-hour Movement Guidelines for Children and Youth ages 5 through 17

Despite the incorporation of other behaviors, the core aspects of the Guidelines exhibit substantial similarity to those in the US and the World Health Organization. Children are encouraged to participate in **at least 60 minutes per day of moderate to vigorous physical activity involving a variety of aerobic activities. Vigorous physical activities, and muscle and bone strengthening activities should each be incorporated at least 3 days per week** (Sweat). Beyond this however, children should engage in **several hours of a variety of structured and unstructured light physical activities** (Step); which aligns with aspects of the 10,000 step count goal. The Guidelines also recommend that **children aged 5 to 13 years obtain 9 to 11 hours of uninterrupted sleep with consistent bed and wake-up times. But between 14 and 17 years of age that can be reduced to 8 to 10 hours** (Sleep). Finally, children should obtain **no more than two hours per day of recreational screen time and limit sitting for extended periods of time** (Sit). Compellingly, evidence suggests that the more aspects of the guidelines that are achieved, the greater the benefit for health and wellness.

24-hour Movement Guidelines for Adults

Although the Guidelines for adults do not similarly emphasize the four categories of **Sweat, Step, Sleep, and Sit** in the way that is done for children; they still provide guidelines within each area. Again the Guidelines are similar to those in the US and the World Health Organization in recommending that adults should engage in **at least 150 minutes (2 hours and 30 minutes) a week of moderate to vigorous intensity aerobic physical activity; and perform muscle strengthening activities using major muscle groups at least twice a week** (Sweat). However, the reduced time for vigorous intensity activity is notably absent reflecting the confusing nature of the US recommendations and potential injury risk. The Guidelines recommend that adults **engage in several hours of light physical activities, including standing** (Step); however, no specific guidance is provided as to how many hours should be obtained. The Guidelines recommend adults obtain **7 to 9 hours of good-quality sleep on a regular basis, with consistent bed and wake-up times** (Sleep). Further, adults should **limit sedentary time to 8 hours or less, including no more than 3 hours of recreational screen time and breaking up sitting for long periods as often as possible** (Sit).

Although there is understandable criticism in the lack of specific goals for some aspects of the 24–hour Movement Guidelines — particularly for aspects of light physical activity and limitations on long periods of sitting; the approach reflects the utilization of a different approach to public health recommendations. Rather than delaying dissemination of goal behaviors until clear evidence exists of a particular threshold necessary for benefits is established; the Canadian 24–hour Movement Guidelines sought to make the public aware that such behaviors were related to health and wellness. Recall that a key criticism of the US and World Health Organization Guidelines was that the guidelines set **a lower, more attainable goal to get the general public on the right path**. So if attainment of the goal may not actually be sufficient to achieve optimal health; there is little added benefit of delaying recommendations to set such a goal. While recommending a behavioral pattern without a particular goal behavior was done due to a lack of evidence to recommend such a goal behavior; there remains debate that it may be preferable for the Guidelines to set an arbitrary goal that could later be refined. Such arguments stem from research in motivated behavior suggesting better adherence to behavioral patterns when specific goal behaviors are provided.

Additional Resources:

Physical Activity Guidelines for Americans:
https://health.gov/sites/default/files/2019-09/Physical_Activity_Guidelines_2nd_edition.pdf

World Health Organization. Guidelines on physical activity and sedentary behaviour. Geneva: World Health Organization; 2020.:
https://iris.who.int/bitstream/handle/10665/336656/9789240015128-eng.pdf

Canadian 24–hour Movement Guidelines:
https://csepguidelines.ca/

Physical Activity Guidelines

For Americans

- First published in 2008, the U.S. Department of Health and Human Services publishes Physical Activity Guidelines for Americans to provide information and guidance on the types and amounts of physical activity that provide substantial health benefits.
- Target audience:
  - Policymakers
  - Health professionals
  - Members of the public

Provide general purpose recommendations that broadly support enhanced health and wellness.

Physical Activity Guidelines

For Americans

- How can we provide general purpose recommendations if the evidence-base surrounding the benefits of physical activity is inconsistent?
  - Nuanced approaches for implementation
  - Ways of approaching physical activity
  - Specific criteria for consideration of activity
- These nuances are critical for understanding why physical activity might impact upon particular disease states, and if the recommendations do not activate the necessary mechanisms to address the disease/disorder then no benefit should be expected.

Physical Activity Guidelines

For Americans

- There remains debate about the veracity of such broad-base general purpose recommendations for any given disease/disorder, with discussion over:
  - How much physical activity is necessary
  - How that physical activity is engaged in
- But this level of nuance is problematic from a public health standpoint as the general public simply has insufficient health literacy to understand.

How Can We Provide General Recommendations

Given the Nuance in Activities?

- The decision to put forth general recommendations stemmed from the evidence that the vast majority of the US population is inactive.
  - Much of the population may not have the physical capacity or willingness to engage in the more specific aspects — and often more intense levels — of physical activity necessary to address particular disease/disorder states.

It is better to provide a lower, more attainable goal that sets the general public on the right path.

How Can We Provide General Recommendations

Given the Nuance in Activities?

It is better to provide a lower, more attainable goal that sets the general public on the right path.

- Popular conceptions and understandings of disease/disorder states have begun to be challenged by modern evidence.
- Since the general public may have insufficient health literacy to understand, there may be conflict between the recommendations and their general beliefs.
  - May result in the outright rejection of the recommendations.
- May may be more willing to accept generalized recommendations.

Physical Activity Recommendations for

Children Ages 6 to 17

- Children and adolescents should do 60 minutes (1 hour) or more of physical activity daily.
  - **Aerobic Activities**: Most of the 60 or more minutes per day should be either moderate- or vigorous-intensity aerobic physical activity. Include vigorous-intensity physical activity at least 3 days per week.
  - **Muscle-strengthening Activities**: Include muscle-strengthening physical activity on at least 3 days of the week, as part of the 60 or more minutes.
  - **Bone-strengthening Activities**: Include bone-strengthening physical activity on at least 3 days of the week, as part of the 60 or more minutes.

Physical Activity Recommendations for

Children Ages 6 to 17

- Activities should be age-appropriate and enjoyable.
- It is very important that children and adolescents participate in a variety of activities, especially activities that they enjoy.
  - This enhances skill development, reduces the risk of overuse injuries and increases the likelihood of continuing to be active as they get older.
- The Guidelines consider the natural activity patterns of children.
  - Children often move between short bursts of activity and short periods of rest.
  - All episodes of moderate- or vigorous-intensity activities count towards daily requirement and, unstructured active play can provide all 3 types of physical activity.

Physical Activity Recommendations for

Adults

For health benefits, adults should do:

- At least 150 minutes a week of moderate-intensity aerobic activity.

Or

- 75 minutes a week of vigorous-intensity aerobic physical activity.

Or

- An equivalent combination of moderate- and vigorous-intensity aerobic activity.

Physical Activity Recommendations for

Adults

Moderate Intensity Activity

150 minutes per week

Moderate Intensity = 3.0 METS

150 x 3 = 450

Vigorous Intensity Activity

75 minutes per week

Vigorous Intensity = 6.0 METS

75 * 6 = 450

Equivalent Combination Activity

90 minutes per week of Moderate Intensity = 3.0 METS
30 minutes per week of Vigorous Intensity = 6.0 METS

(90 * 3) + (30 * 6) = 450

Physical Activity Recommendations for

Adults

For health benefits, adults should do:

- Moderate or high-intensity muscle strengthening activities that involve all major muscle groups at least 2 days a week.

- Avoid Inactivity
  - Some physical activity is better than none, and adults who participate in any amount of physical activity gain some health benefits.

Physical Activity Recommendations for

Adults

- The major criticisms of these public health recommendations surround not only what the recommendations are, but the way in which they are conveyed.
  - Metabolic equivalents of tasks are conceptually straight forward.
  - Smartphone devices and equipment that report calories expended are increasingly common.
    - The general public is likely far more familiar with caloric expenditure than metabolic equivalents

Physical Activity Recommendations for

Adults

Caloric Expenditure Equivalent

$$kilocalories = \frac{MET \times 3.5 \times kg\ of\ mass \times Minutes}{200}$$

For a 60 kg (132 lb) individual:

- At least 150 minutes a week of moderate-intensity aerobic activity.

$$kilocalories = \frac{3\ METS \times 3.5 \times 60 \times 150}{200} = 472.5$$

- 75 minutes a week of vigorous-intensity aerobic physical activity.

$$kilocalories = \frac{6\ METS \times 3.5 \times 60 \times 75}{200} = 472.5$$

Physical Activity Recommendations for

Adults

- The major criticisms of these public health recommendations surround not only what the recommendations are, but the way in which they are conveyed.
  - Metabolic equivalents of tasks are conceptually straight forward.
  - Smartphone devices and equipment that report calories expended are increasingly common.
    - The general public is likely far more familiar with caloric expenditure than metabolic equivalents
    - **Accumulate at least 8 calories of expenditure per kilogram of body mass** ($\frac{472.5}{60} = 7.875$).

Physical Activity Recommendations for

Adults

- The major criticisms of these public health recommendations surround not only what the recommendations are, but the way in which they are conveyed.
  - Recommendations for children are daily.
  - Recommendations for adults are weekly.
    - Assumes that adults will accumulate occupational physical activity.
    - Helps disguise how little physical activity is being recommended.

Physical Activity Recommendations for

Adults

Weekly

150 minutes per week

For a 60 kg (132 lb) individual:

$$kilocalories = \frac{3\ METS \times 3.5 \times 60 \times 150}{200} = 472.5$$

Daily

22 minutes per day

For a 60 kg (132 lb) individual:

$$kilocalories = \frac{3\ METS \times 3.5 \times 60 \times 22}{200} = 69.3$$

Recommendations are specific to Exercise-Related Physical Activity

So the recommendation for adults is to accumulate:

22 minutes of moderate intensity exercise each day

Or **11 minutes of vigorous intensity exercise**

Expend 1.1 kcals per kg of body weight each day ($\frac{69.3}{60} = 1.1$)

Physical Activity Recommendations for

Adults

- The World Health Organization Guidelines on Physical Activity and Sedentary Behavior mirror those of the Physical Activity Guidelines for Americans.
  - There is substantial overlap in the advisory boards that created these recommendations for these organizations.
  - Same people = Same recommendations.

Physical Activity Recommendations for

Adults

- This approach of setting the recommendation based upon exercise activity rather than overall physical activity stands in contrast to the World Health Organization framework for classification of physical activity levels (PALs).
  - Recommendation: Expend 1.1 kcals per kg of body weight each day in Exercise
  - Moderate activity: PAL of 1.7 (total energy expenditure)
    - Would need to know metabolic rate, thermic effect of food, non-exercise related physical activity.

Physical Activity Recommendations for

Adults

Assumptions

60 kg (132 lb) individual
20% Body Fat

Metabolic rate:
$23 \times (60\ \text{kg} \times (1 - 20\%\ \text{fat})) = 1{,}104$ kcal

Caloric Intake = 2,000 kcal
Thermic Effect of Food = 200 kcal

Total PA is 4 times exercise-related activity
$70 \times 4 = 280$ kcal

Recommendations in terms of Physical Activity Level

$$PAL = \frac{(BMR + TEF + PA)}{BMR}$$

$$PAL = \frac{(1104 + 200 + 280)}{1104}$$

$$PAL = 1.4$$

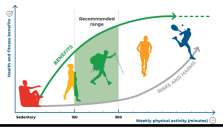
PAL below 1.4 are considered Extremely Inactive

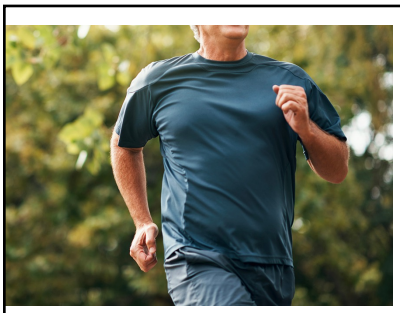
Recommendations for

Safe Physical Activity

Physical activity has many benefits and is safe for almost everyone, but injuries, adverse events, and issues do occur.

- Exceeding physical activity recommendations is associated with greater health benefits.
- Above 300 minutes (5 hours) per week, the benefit per minute decreases and the risk of injury increases for adult populations.





For those with existing heart disease, cardiac events occur at a rate of one for every 62,000 hours of activity.

(If 186k people did 20 min of exercise, at least one should have a cardiac event occur)

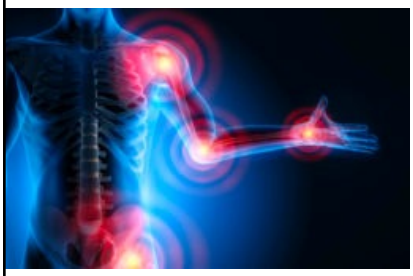
For those without existing heart disease, cardiac events occur at a rate of one for every 400,000 to 800,000 hours of activity.

Recommendations for

Safe Physical Activity

Physical activity has many benefits and is safe for almost everyone, but injuries, adverse events, and issues do occur.

- Risks of cardiovascular incident are extremely low.
  - The concern is that when they do happen they tend to be fatal.
    - Occur without warning.
    - Occur in remote settings.
    - Lack of individuals knowledgeable about how to help.



For every 1,000 hours of walking, or 250 hours of running, One musculoskeletal injury occurs.

Musculoskeletal injuries severe enough to require medical treatment only occur at a rate of one for every 5,000 hours of activity.

Recommendations for

Safe Physical Activity

Physical activity has many benefits and is safe for almost everyone, but injuries, adverse events, and issues do occur.

- Risks of cardiovascular incident are extremely low.
  - The concern is that when they do happen they tend to be fatal.
    - Occur without warning.
    - Occur in remote settings.
    - Lack of individuals knowledgeable about how to help.
- Risk of musculoskeletal injury is relatively low for children in general, as well as for adults participating in unorganized leisure time activity.

Recommendations for

Safe Physical Activity

Physical activity has many benefits and is safe for almost everyone, but injuries, adverse events, and issues do occur.

- Organized sport participation increases the relative risk of a musculoskeletal injury particularly in instances of sport specialization.
  - Incurring an upper extremity overuse injury (odds ratio 1.96 [95% CI 1.17 to 3.43]).
  - Incurring a lower extremity injury:
    - Moderate specialization (OR 2.38 [95% CI 1.86 to 3.05]).
    - High specialization (OR 2.58 [95% CI 1.88 to 3.54]).

Recommendations for
Safe Physical Activity

- Higher intensity activity can enable an individual to meet physical activity recommendations within a shorter period of time.
- Higher intensity activity also places the individual at much greater risk of injury.
- It is important that the types and intensities of activity be appropriate for the individuals current level of fitness and health.

Greater exercise intensity is associated with higher injury risk

Recommendations for
Safe Physical Activity

- For individuals with low levels of fitness and/or significant chronic conditions, physical activity should be increased gradually over time.
- "Start low and go slow" by gradually increasing how often and how long activities are done.
  - Evidence suggests that adding a small and comfortable amount of light to moderate-intensity activity (5 to 15 minutes of walking) has a low risk of musculoskeletal and cardiac incidents.

Greater exercise intensity is associated with higher injury risk

Recommendations for
Safe Physical Activity

- There are well-established differences in the physical risks associated with particular playing surfaces:
  - Grass vs Turf
  - Clay vs Concrete
  - Dirt vs Gravel
- Using specialized equipment or altering equipment can reduce some risks.
  - Using extremely low profile cleats, shoes with fewer cleats or specialized cleat designs can reduce risks associated with turf fields.

Safety equipment only works when the appropriate equipment is used.

Recommendations for
Safe Physical Activity

- Individuals who identify as representing racial, ethnic, or sexual identity subgroups are generally much more cognizant of the places, communities, and ways in which they feel that they can safely engage in activity.
- The unfortunate reality is that physical activity engagement can provide an opportunity for criminal, malfeasance, and generally problematic behaviors.
- Some places were people could choose to be active may be particularly problematic and expose the individual to unnecessary risk.

Risks associated with the places where we choose to be active also encompasses sociocultural issues.

Recommendations for
Safe Physical Activity

- During very hot and humid weather the risk of heat exhaustion/stroke and dehydration rise considerably if proper precautions are not taken.
  - Sporting environments are gradually shifting their awareness of this:
    - Moving practices/games to times of the day with lower temperature and less humidity
    - Utilizing proactive cooling strategies to mitigate the potential for heat stress.

The idea of environmental considerations reflects the risks related to weather conditions.

Recommendations for
Safe Physical Activity

- During very hot and humid weather the risk of heat exhaustion/stroke and dehydration rise considerably if proper precautions are not taken.
  - Due to misconceptions regarding how adipose tissue is expelled from the body and outdated perspectives on training; **there remains a considerable portion of the population who place themselves at unnecessary risk for minimal benefit**.
  - "I suffered through it, so you should be able to as well"

The idea of environmental considerations reflects the risks related to weather conditions.

Recommendations for

Safe Physical Activity

- A middle-aged adult male with risk factors for cardiovascular disease going for an early morning run by themselves represents an exceptionally high risk activity.
  - Should they have a heart attack, there may be no one there to render immediate care (decreasing the likelihood that they will survive the heart attack).
- Consulting with a professional and engaging in the activity in a supervised environment greatly reduces the risk of injuries and adverse events.
  - Can properly advise regarding the types and amounts of activity that are appropriate.

Individuals with chronic health conditions, poor overall health, and even certain mental health risks may require a greater level of supervision in engaging in physical activity.

Recommendation for

10,000 Steps Per Day

- Not actually a part of the Physical Activity Guidelines for Americans.
- Step-based physical activity recommendations predate the emergence of modern smartphone/smartwatch devices.
  - As steps are a basic unit of locomotion they provide a relatively easy to understand measure of activity that could be assessed with low cost pedometers (devices that measure the number of steps taken).
- The notion of accumulating 10,000 steps per day is largely attributed to public health efforts in Japan in the 1960's that were reinvigorated in the early 2000's.

Recommendation for

10,000 Steps Per Day

- The 10,000 step goal was not set in response to specific evidence of effectiveness relative to health or wellness; but rather was established because it was conceptually easy to remember.
  - There is plenty of evidence that 10,000 steps is better than 5,000 steps.
  - The issue is why not 8,000 or 12,000 steps?

The energetic cost of walking is generally around 0.03 to 0.04 kcals per step; so an individual who accumulates 10,000 steps would expend around 300 to 400 kcals in physical activity per day.

Recommendation for

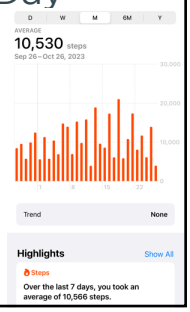
10,000 Steps Per Day

- The criticism of this concept is that around 80% of daily steps are at an intensity corresponding to light intensity physical activity
  - So even if an individual meets their step count goal they may not have done so at an intensity sufficient to meet physical activity recommendations.
- There are also concerns related to the inability of pedometers to:
  - Accurately track the intensity of activities
  - Failing to capture certain movements
  - Inaccurately estimating caloric expenditure as a result of not taking into account the individual's mass and the intensity of walking

Recommendation for

10,000 Steps Per Day

- Most devices now use accelerometers instead of pedometers.
  - Enables characterizing the intensity of the movement.
  - 3-axis accelerometers cost $3 to $15.
- Many of the issues about intensity and caloric expenditure can be easily addressed by integrating accelerometers with smart devices that can incorporate measures of weight.



Recommendation for

10,000 Steps Per Day

- From a public health standpoint, such step-count based recommendations are still viewed as advantageous.
  - Most people have a device that would enable tracking steps.
  - Most people are aware of the 10,000 step goal.
  - Physical activity recommendations aim to **set the general public on the right path towards being more physically active**.
    - Even if some portion of the steps are not of moderate to vigorous intensity.

Recommendation for

10,000 Steps Per Day

Physical Activity Guidelines for Americans	Attain 10,000 Steps per Day
150 minutes per week	0.03 to 0.04 kcals per step
22 minutes per day	10,000 steps
About 60 to 70 kcals per day in moderate to vigorous physical activity	About 300 to 400 kcals per day in physical activity

24-Hour Movement Guidelines for

Children and Youth ages 5 to 17

Sweat	Step	Sleep	Sedentary Behavior
Moderate to Vigorous Physical Activity	Light Physical Activity	Sleep	Sedentary Behavior
At least 60 minutes per day of moderate to vigorous physical activity involving a variety of aerobic activities. Vigorous physical activities, and muscle and bone strengthening activities should each be incorporated at least 3 days per week.	Several hours of a variety of structured and unstructured light physical activities	Consistent bed and wake-up times. Ages 5–13 years: Uninterrupted 9 to 11 hours of sleep per night. Ages 14–17 years: Uninterrupted 8 to 10 hours per night.	No more than 2 hours per day of recreational screen time. Limit sitting for extended periods.

24-Hour Movement Guidelines for

Adults

Sweat	Step	Sleep	Sedentary Behavior
Moderate to Vigorous Physical Activity	Light Physical Activity	Sleep	Sedentary Behavior
At least 150 minutes per week of moderate to vigorous aerobic physical activity. Muscle strengthening activities using major muscle groups at least twice per week.	Several hours of light physical activities, including standing.	Consistent bed and wake-up times. 7 to 9 hours of good-quality sleep on a regular basis.	Limit sedentary time to 8 hours or less. No more than 3 hours per day of recreational screen time. Break up long periods of sitting as often as possible.

US / WHO Approach	Canadian 24-Hour Approach
Wait to provide specific recommendation on goal behavior until clear evidence exists of a particular threshold necessary for benefits is established. Set recommendation on the minimally observable effect that gets the general public on the right path.	Make the public aware that there is evidence of a link between specific behaviors and health even if the threshold necessary for benefits is not yet known. **Providing an arbitrary goal that could be later refined would likely enhance adherence to goal behaviors.**

Physical Activity Recommendations Worksheet

1. What is the purpose of providing general recommendations for physical activity if the evidence base surrounding the benefits of physical activity are inconsistent with regard to their intensity, duration, and mode across various diseases?

2. What are the US physical activity recommendations for Adolescents aged 6 through 17?

3. What are the US physical activity recommendations for Adults?

4. Complete the table below determining the equivalent energy expenditure if the MET intensity was altered.

	Original Activity		Equivalent Activity	
Case	**MET Intensity**	**Duration (min)**	**MET Intensity**	**Duration (min)**
Case 1	3.0	150	6.0	
Case 2	2.0	20	4.0	
Case 3	8.0	5		20
Case 4	1.5		2.5	60
Case 5	7.2	40	4.0	

5. Using the table above, convert the activity from MET and Time into a value for the energy expenditure in kcals (rounded **UP** to the next whole number/integer).

Case	Mass (kg)	Original Activity (kcals)	Equivalent Activity (kcals)
Case 1	60		
Case 2	65		
Case 3	55		
Case 4	75		
Case 5	63		

6. Exceeding the physical activity recommendations beyond what level is associated with reduced benefits and increased risk of injury in adults?

7. Apple watches set the default settings to an initial physical activity goal of 300 kcal per day. If an individual has a basal metabolic rate of 1600, consumes 2000 kcals each day, and meets the goal of 300 kcal of physical activity; what is their physical activity level? What is the PAL classification level of achieving this goal for this individual?

8. Considering the US physical activity recommendations for adults as 1.1 kcals per kg of body weight each day and assuming 25% of their physical activity was in exercise-related physical activity at a moderate to vigorous intensity with a body mass of 60 kg; is this amount of activity sufficient to meet the recommendation?

9. If this individual were to adjust the physical activity goal of their watch to 1000 kcal per day and meet that goal; what would their physical activity level be? What is the PAL classification level of achieving this goal for this individual?

10. Your friend traveled to Disney World over the break and posted on social media that they averaged 14,000 steps per day. Using the average energetic cost of walking (0.035 kcals per step), what was their average energy expenditure in kcals?

11. Considering the US physical activity recommendations for adults as 1.1 kcals per kg of body weight each day and assuming 80% of their physical activity while at Disney was in exercise-related physical activity at a moderate to vigorous intensity with a body mass of 56 kg; how may times over did they exceed the US physical activity recommendations (rounded to the nearest whole number/integer)?

12. Public health recommendations regarding safe physical activity encompass what two aspects of safety?

13. In regards to the second aspect of the public health recommendations regarding safe physical activity; what are the three major categories of overarching considerations?

14. What are the practical differences between the US and Canadian guidelines for children?

15. What are the practical differences between the US and Canadian guidelines for adults?

16. What are the philosophical differences between the US and Canadian guidelines?