Updated September 2022

FAMILY & COMMUNITY HEALTH (FCH)

QUIZ BOWL RESOURCES

The following resource books will be used at the State level Quiz Bowl Contest.

County and District level resources may differ. Please reference your county and district contest rules and guidelines for those specific details.

SENIOR

Family & Community Health Quiz Bowl Study Guide 2022-2023 – Food & Nutrition
Posted at https://texas4-h.tamu.edu/quiz/

Healthy Lifestyles *(Resources found within this packet)*

- Food Packaging
- Physical Activity
  - Chapter 1
  - Chapter 2
  - Chapter 3
- E-cigarettes and Vaping
  - Electronic Cigarettes and Young People https://www.cdc.gov/tobacco/basic_information/e-cigarettes/Quick-Facts-on-the-Risks-of-E-cigarettes-for-Kids-Teens-and-Young-Adults.html

Consumer Decision Making *(Resources found within this packet)*

- Sunglasses

TEXAS A&M AGRILIFE EXTENSION

Understanding Food Packaging and Marketing Claims
Do You Know What You're Eating?

"Non-GMO" or "GMO-Free"

- Used by the food industry to advertise that a food is free from genetically modified organisms. This is a VOLUNTARY label

"Local"

- Produced and processed within a particular area (e.g. within an undefined # of miles, commonly considered to be less than 400 miles from its origin, or within the State in which it is produced)

"Natural"

- Generally means that a product has nothing artificial or synthetic added to it

"Fresh"

- Food is unprocessed and has not been frozen or subjected to any form of thermal processing or any other form of preservation
- NOTE: This definition still allows for wax coatings, post harvest use of approved pesticides, application of mild chlorine wash, and treatment with ionizing radiation

*Terms in **RED** do NOT have a formal definition right now...Stay tuned!

"Made with Organic _____"

- Used when a product contains at least 70% organic ingredients (excluding salt and water)

"Organic"

- any product that contains a minimum of 95% organic ingredients (excluding salt and water)

"100% Organic"

- Any product that contains 100% organic ingredients (excluding salt and water)

"USDA Certified Organic"

- Grown and processed using strict guidelines
- NO genetically modified organisms
- Produce: no synthetic fertilizers/pesticides
- Meat: animals raised in living conditions that reflect their natural behavior, fed 100% organic feed and forage, and not given antibiotics or hormones
- Packaged foods: no artificial preservatives, colors, or flavors; ingredients are organic with a few exceptions (ex: baking soda, pectin, etc.)

Grain Terms

"Whole Grains"

- Whole grains contain the bran, germ, and endosperm (examples of whole grains: brown rice, oatmeal, corn)

Egg and Chicken Terms

"100% or All-Natural"
-Only means nothing was added to the egg (coloring, flavoring)
- Does NOT indicate how the chicken was raised

"USDA Organic"
- Certified organic eggs are from uncaged hens that have free range of their houses and access to outdoor spaces. They are also fed an organic diet

"Vitamin Enhanced"
-Hens are given a special diet that helps them produce eggs with a higher vitamin content (e.g. Vitamin E)

"Omega-3 Enriched"
- Hens are fed a diet that includes flaxseed, algae or fish oils to increase the Omega-3 fatty acid content of the eggs

"No Antibiotics"
-Hens are raised without any antibiotics of any type

"No added Hormones"
- NO eggs have added hormones (regardless of what the package says) because the use of hormones is NOT allowed in hog or poultry production
- If you see "No added hormones" on a package, it must be followed by the statement: "Federal regulations prohibit the use of hormones"

"Free-range"
-Hens are cage free with continuous access to the outdoors during their laying cycle

"Cage-free"
- Hens are raised in an enclosed structure with unlimited access to food and water. They are NOT required to have access to the outdoors

"No rBST (or rBGH)"
- rBST and rBGH are growth hormones that are given to cows to increase milk production

"Ultrapasteurized (UHT)" Milk
- Milk has been heated to at least 280 degrees F for 2 seconds. This increases shelf life, but may cause a "cooked" flavor

"USDA Organic"
-Cows have year round access to outdoors/pasture. No hormones are used. Cows are fed an organic diet (grains, forage)

"Grass-fed Beef"
- 100% Grass Fed means an animal is fed forage 100% (no grain crops) after being weaned from their mother's milk

Milk and Beef Terms

Physical Activity Guidelines for Americans

2nd edition

MESSAGE FROM THE SECRETARY

Regular physical activity is one of the most important things people can do to improve their health. Moving more and sitting less have tremendous benefits for everyone, regardless of age, sex, race, ethnicity, or current fitness level. Individuals with a chronic disease or a disability benefit from regular physical activity, as do women who are pregnant. The scientific evidence continues to build—physical activity is linked with even more positive health outcomes than we previously thought. And, even better, benefits can start accumulating with small amounts of, and immediately after doing, physical activity.

Today, about half of all American adults—117 million people—have one or more preventable chronic diseases. Seven of the ten most common chronic diseases are favorably influenced by regular physical activity. Yet nearly 80 percent of adults are not meeting the key guidelines for both aerobic and muscle-strengthening activity, while only about half meet the key guidelines for aerobic physical activity. This lack of physical activity is linked to approximately $117 billion in annual health care costs and about 10 percent of premature mortality.

This new edition of the *Physical Activity Guidelines for Americans* has the potential to change that situation. It is grounded in the most current scientific evidence and informed by the recommendations of the 2018 Physical Activity Guidelines Advisory Committee. This Federal advisory committee, which was composed of prestigious researchers in the fields of physical activity, health, and medicine, conducted a multifaceted, robust analysis of the available scientific literature. Their work culminated in the *2018 Physical Activity Guidelines Advisory Committee Scientific Report*, which provided recommendations to the Federal Government on physical activity, sedentary behavior, and health. Informed by this Scientific Report and by public and Federal agency comments, the new edition provides guidance on the amounts and types of physical activity necessary to maintain or improve overall health and reduce the risk of, or even prevent, chronic disease.

The *Physical Activity Guidelines for Americans* is an essential resource for health professionals and policymakers as they design and implement physical activity programs, policies, and promotion initiatives. It provides information that helps Americans make healthy choices for themselves and their families, and discusses evidence-based, community-level interventions that can make being physically active the easy choice in all the places where people live, learn, work, and play.

Progress to reverse the high rates of inactivity-related chronic diseases and low rates of physical activity will require comprehensive and coordinated strategies. The Physical Activity Guidelines is an important part of a complex and integrated solution to promote health and to reduce the burden of chronic disease in our country. We all have a role to play in this critical effort. I invite you to join me in helping our country be more physically active. If we all move more and sit less today and work toward meeting the Physical Activity Guidelines ourselves, we will be well on our way to creating a healthier Nation and ensuring everyone can live healthier and more active lives.

Alex M. Azar II
Secretary
U.S. Department of Health and Human Services

Table of Contents

U.S. Department of Health and Human Services. *Physical Activity Guidelines for Americans, 2nd edition*. Washington, DC: U.S. Department of Health and Human Services; 2018.

Acknowledgments

The U.S. Department of Health and Human Services would like to recognize the efforts of the Physical Activity Guidelines Co-Executive Secretaries and other Federal staff who oversaw the work of the 2018 Physical Activity Guidelines Advisory Committee and served on the writing team.

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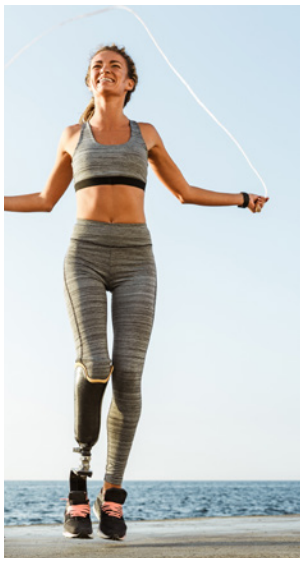
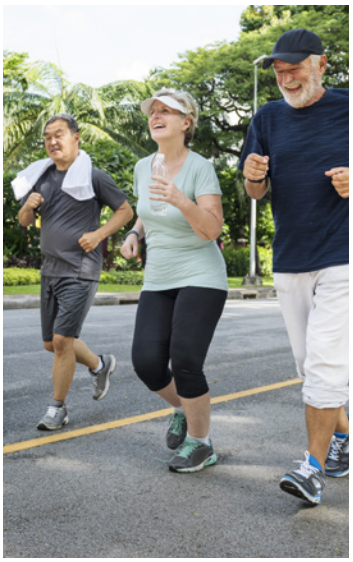
The Department greatly appreciates Anne Brown Rodgers' work as the scientific writer/editor for both the *2018 Physical Activity Guidelines Advisory Committee Scientific Report* and the *Physical Activity Guidelines for Americans*, 2nd edition. The Department also acknowledges the important role of those who provided comments throughout the Physical Activity Guidelines development process. The Department acknowledges the contributions of the external peer reviewers—David M. Buchner, MD, MPH; Peter T. Katzmarzyk, PhD; Arthur F. Kramer, PhD; I-Min Lee, ScD, MPH; Karin A. Pfeiffer, PhD; Brian E. Saelens, PhD—and numerous other departmental scientists, staff, and policy officials who reviewed the draft *Physical Activity Guidelines for Americans*, 2nd edition and provided helpful comments. Additionally, the Department acknowledges Frances Bevington for managing the layout and design of the Guidelines and leading the Move Your Way campaign.





Physical Activity Guidelines for Americans Summary

Being physically active is one of the most important actions that people of all ages can take to improve their health. The evidence reviewed for this second edition of the *Physical Activity Guidelines for Americans* is clear—physical activity fosters normal growth and development and can make people feel better, function better, sleep better, and reduce the risk of a large number of chronic diseases. Health benefits start immediately after exercising, and even short episodes of physical activity are beneficial. Even better, research shows that just about everyone gains benefits: men and women of all races and ethnicities, young children to older adults, women who are pregnant or postpartum (first year after delivery), people living with a chronic condition or a disability, and people who want to reduce their risk of chronic disease. The evidence about the health benefits of regular physical activity is well established, and research continues to provide insight into what works to get people moving, both at the individual and community level. Achieving the benefits of physical activity depends on our personal efforts to increase activity in ourselves, family, friends, patients, and colleagues. Action is also required at the school, workplace, and community levels.

What's New in This Edition?

This second edition of the *Physical Activity Guidelines for Americans* provides science-based guidance to help people ages 3 years and older improve their health through participation in regular physical activity. It reflects the extensive amount of new knowledge gained since the publication of the first *Physical Activity Guidelines for Americans*, released in 2008. This edition of the Guidelines discusses the proven benefits of physical activity and outlines the amounts and types of physical activity recommended for different ages and populations. For example, new aspects include discussions of:

- Additional health benefits related to brain health, additional cancer sites, and fall-related injuries;
- Immediate and longer term benefits for how people feel, function, and sleep;
- Further benefits among older adults and people with additional chronic conditions;
- Risks of sedentary behavior and their relationship with physical activity;
- Guidance for preschool children (ages 3 through 5 years);
- Elimination of the requirement for physical activity of adults to occur in bouts of at least 10 minutes; and
- Tested strategies that can be used to get the population more active.

Developing the Physical Activity Guidelines

The *Physical Activity Guidelines for Americans* is issued by the U.S. Department of Health and Human Services (HHS). It complements the *Dietary Guidelines for Americans*, a joint effort of HHS and the U.S. Department of Agriculture (USDA). Together, the two documents provide guidance for the public on the importance of being physically active and eating a healthy diet to promote good health and reduce the risk of chronic diseases.

The primary audience for the *Physical Activity Guidelines for Americans* is policy makers and health professionals, though it may also be useful to interested members of the public. The main idea behind the Guidelines is that regular physical activity over months and years can produce long-term health benefits.

Learn More

For more information on the terms used in this document, see Glossary.

The development of this edition of the *Physical Activity Guidelines for Americans* started in 2016 when former HHS Secretary Sylvia Mathews Burwell appointed an external scientific advisory committee, the 2018 Physical Activity Guidelines Advisory Committee. The Committee conducted a series of systematic reviews of the scientific literature on physical activity and health and met periodically in public session to discuss their findings. The Committee's work was compiled into a scientific report summarizing the current evidence. The *2018 Physical Activity Guidelines Advisory Committee Scientific Report* and summaries of the Committee's meetings are available at https://www.health.gov/PAGuidelines/.

When writing the Guidelines, HHS used the Advisory Committee's Scientific Report as its primary source but also considered comments from the public and government agencies. The Guidelines will be widely promoted through various communications strategies online and in print, such as the *Move Your Way* campaign materials for professionals and consumers, and partnerships with organizations that promote physical activity.

Key Guidelines

Below are the key guidelines included in the *Physical Activity Guidelines for Americans*. The later chapters provide context and additional information related to these summary statements.

Key Guidelines for Preschool-Aged Children

- Preschool-aged children (ages 3 through 5 years) should be physically active throughout the day to enhance growth and development.
- Adult caregivers of preschool-aged children should encourage active play that includes a variety of activity types.

Key Guidelines for Children and Adolescents

- It is important to provide young people opportunities and encouragement to participate in physical activities that are appropriate for their age, that are enjoyable, and that offer variety.
- Children and adolescents ages 6 through 17 years should do 60 minutes (1 hour) or more of moderate-to-vigorous physical activity daily:
  - **Aerobic:** Most of the 60 minutes or more per day should be either moderate- or vigorous-intensity aerobic physical activity and should include vigorous-intensity physical activity on at least 3 days a week.
  - **Muscle-strengthening:** As part of their 60 minutes or more of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least 3 days a week.
  - **Bone-strengthening:** As part of their 60 minutes or more of daily physical activity, children and adolescents should include bone-strengthening physical activity on at least 3 days a week.

Key Guidelines for Adults

- Adults should move more and sit less throughout the day. Some physical activity is better than none. Adults who sit less and do any amount of moderate-to-vigorous physical activity gain some health benefits.
- For substantial health benefits, adults should do at least 150 minutes (2 hours and 30 minutes) to 300 minutes (5 hours) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) to 150 minutes (2 hours and 30 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Preferably, aerobic activity should be spread throughout the week.
- Additional health benefits are gained by engaging in physical activity beyond the equivalent of 300 minutes (5 hours) of moderate-intensity physical activity a week.
- Adults should also do muscle-strengthening activities of moderate or greater intensity and that involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.

Key Guidelines for Older Adults

The key guidelines for adults also apply to older adults. In addition, the following key guidelines are just for older adults:

- As part of their weekly physical activity, older adults should do multicomponent physical activity that includes balance training as well as aerobic and muscle-strengthening activities.
- Older adults should determine their level of effort for physical activity relative to their level of fitness.
- Older adults with chronic conditions should understand whether and how their conditions affect their ability to do regular physical activity safely.
- When older adults cannot do 150 minutes of moderate-intensity aerobic activity a week because of chronic conditions, they should be as physically active as their abilities and conditions allow.

Key Guidelines for Women During Pregnancy and the Postpartum Period

- Women should do at least 150 minutes (2 hours and 30 minutes) of moderate-intensity aerobic activity a week during pregnancy and the postpartum period. Preferably, aerobic activity should be spread throughout the week.
- Women who habitually engaged in vigorous-intensity aerobic activity or who were physically active before pregnancy can continue these activities during pregnancy and the postpartum period.
- Women who are pregnant should be under the care of a health care provider who can monitor the progress of the pregnancy. Women who are pregnant can consult their health care provider about whether or how to adjust their physical activity during pregnancy and after the baby is born.

Key Guidelines for Adults With Chronic Health Conditions and Adults With Disabilities

- Adults with chronic conditions or disabilities, who are able, should do at least 150 minutes (2 hours and 30 minutes) to 300 minutes (5 hours) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) to 150 minutes (2 hours and 30 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Preferably, aerobic activity should be spread throughout the week.
- Adults with chronic conditions or disabilities, who are able, should also do muscle-strengthening activities of moderate or greater intensity and that involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.
- When adults with chronic conditions or disabilities are not able to meet the above key guidelines, they should engage in regular physical activity according to their abilities and should avoid inactivity.

- Adults with chronic conditions or symptoms should be under the care of a health care provider. People with chronic conditions can consult a health care professional or physical activity specialist about the types and amounts of activity appropriate for their abilities and chronic conditions.

Key Guidelines for Safe Physical Activity

To do physical activity safely and reduce risk of injuries and other adverse events, people should:

- Understand the risks, yet be confident that physical activity can be safe for almost everyone.
- Choose types of physical activity that are appropriate for their current fitness level and health goals, because some activities are safer than others.
- Increase physical activity gradually over time to meet key guidelines or health goals. Inactive people should "start low and go slow" by starting with lower intensity activities and gradually increasing how often and how long activities are done.
- Protect themselves by using appropriate gear and sports equipment, choosing safe environments, following rules and policies, and making sensible choices about when, where, and how to be active.
- Be under the care of a health care provider if they have chronic conditions or symptoms. People with chronic conditions and symptoms can consult a health care professional or physical activity specialist about the types and amounts of activity appropriate for them.

Implementation of the Physical Activity Guidelines Through **Move Your Way**

The Physical Activity Guidelines is written for professional audiences. Therefore, its translation into actionable consumer messages and resources helps individuals, families, and communities achieve the recommendations in the Guidelines. The *Move Your Way* campaign was created by the Office of Disease Prevention and Health Promotion within the U.S. Department of Health and Human Services to be used by communities, health professionals, educators, and others to communicate to consumers in plain language about the recommendations from the Guidelines, promote the health benefits of meeting the recommendations, and provide tips for how consumers can meet the recommendations.

Campaign resources, including interactive tools, fact sheets, videos, and graphics, are available at https://www.health.gov/PAGuidelines/.

Figure A-1. Move Your Way Adult Dosage

A Roadmap to the Physical Activity Guidelines for Americans

- For an overview of the development of the *Physical Activity Guidelines for Americans* and important background information about physical activity, read Chapter 1. Introducing the Physical Activity Guidelines for Americans.
- To learn about the health benefits of physical activity, read Chapter 2. Physical Activity and Health. This information may help motivate people to become regularly active.

> **Note**
>
> The Guidelines assume that many readers will not read all the chapters, but only what is relevant to them. Important information may therefore be repeated in several chapters.

- To understand how to do physical activity in a manner that meets the Guidelines:
  - For youth ages 3 through 17 years, including youth with disabilities, read Chapter 3. Active Children and Adolescents.
  - For adults ages 18 through 64 years, read Chapter 4. Active Adults.
  - For adults ages 65 years and older, read Chapter 5. Active Older Adults. The Guidelines for older adults are similar to those for adults, but add specific guidance, such as the importance of doing multicomponent physical activities.
- For adults with chronic health conditions or disabilities, read Chapter 4. Active Adults or Chapter 5. Active Older Adults and Chapter 6. Additional Considerations for Some Adults. Chapters 4 and 6 are also relevant for women who are pregnant or postpartum.

- To understand how to reduce the risks of activity-related injury, read Chapter 7. Active and Safe.
- To learn about strategies to promote and support regular physical activity, read Chapter 8. Taking Action: Increasing Physical Activity Levels of Americans.
- For definitions of key terms used in the Guidelines, consult the Glossary.
- To find additional information and relevant resources, consult the Appendices.
  1. Physical Activity Behaviors: Intensity, Bouts, and Steps
  2. Federal Physical Activity Resources

Chapter 1. Introducing the Physical Activity Guidelines for Americans

Being physically active is one of the most important actions that people of all ages can take to improve their health. About $117 billion in annual health care costs and about 10 percent of premature mortality are associated with inadequate physical activity (not meeting the aerobic key guidelines). This second edition of the *Physical Activity Guidelines for Americans* provides science-based guidance to help people ages 3 years and older improve their health through appropriate physical activity. It builds on the 2008 Guidelines by incorporating new evidence about even more health benefits, demonstrating greater flexibility about how to achieve those benefits, and showing the many proven ways to help people be more active and to encourage communities to be more conducive to physical activity.

The *Physical Activity Guidelines for Americans* is issued by the U.S. Department of Health and Human Services (HHS). It complements the *Dietary Guidelines for Americans*, a joint effort of HHS and the U.S. Department of Agriculture (USDA). Together, the two documents provide guidance for the U.S. population on the importance of being physically active and eating a healthy diet to promote good health and reduce the risk of chronic diseases.

This chapter provides background information about the rationale and process for developing the Guidelines. It then discusses several issues that provide the framework for understanding the Guidelines. The chapter also explains how the Guidelines fits in with other published physical activity recommendations and how it should be used in practice.

New Evidence of Physical Activity Benefits

Evidence for the benefits of physical activity has continued to grow since the 2008 Guidelines were published. Here are just a few of the recently identified benefits:

- ✓ Improved bone health and weight status for children ages 3 through 5 years.
- ✓ Improved cognitive function for youth ages 6 to 13 years.
- ✓ Reduced risk of cancer at a greater number of sites.
- ✓ Brain health benefits, including possible improved cognitive function, reduced anxiety and depression risk, and improved sleep and quality of life.
- ✓ For pregnant women, reduced risk of excessive weight gain, gestational diabetes, and postpartum depression.
- ✓ For older adults, reduced risk of fall-related injuries.
- ✓ For people with various chronic medical conditions, reduced risk of all-cause and disease-specific mortality, improved physical function, and improved quality of life.

Why and How the Physical Activity Guidelines for Americans Was Developed

The Rationale for Physical Activity Guidelines

Extensive scientific evidence supports the importance of recommending that all Americans should engage in regular physical activity to improve overall health and to reduce the risk of many health problems. Physical activity is a leading example of how lifestyle choices have a profound effect on health. The choices people make about other lifestyle factors, such as diet, smoking, and alcohol use, also have important and independent effects on their health.

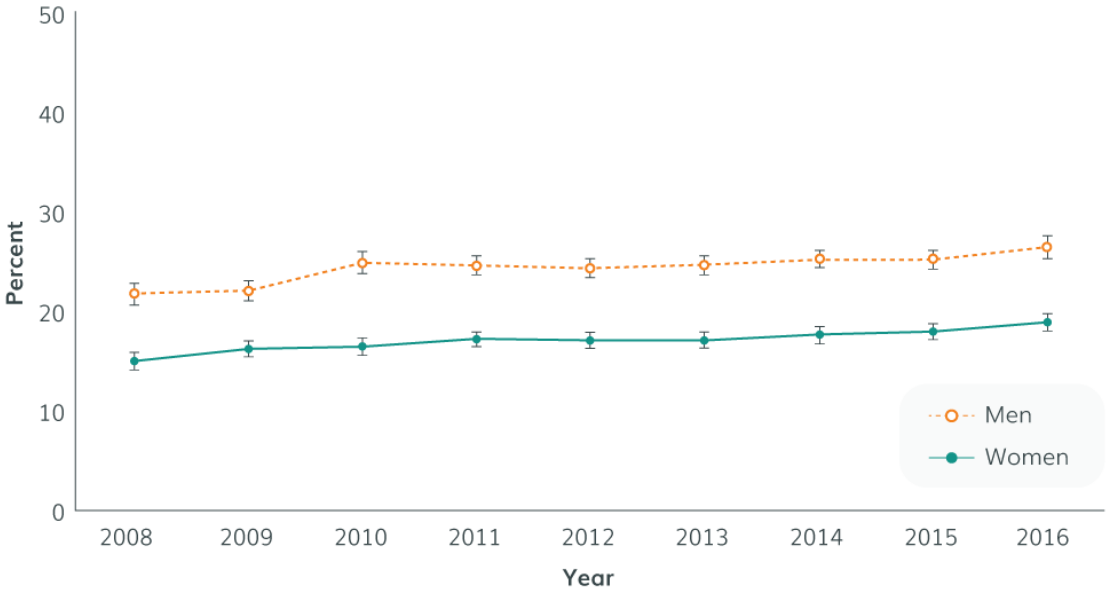
Learn More

See Chapter 2. Physical Activity and Health for more information on the many health benefits of physical activity.

The *Physical Activity Guidelines for Americans* is designed to provide information and guidance on the types and amounts of physical activity that provide substantial health benefits. The primary audience is policy makers and health professionals, though this information may also be useful to interested members of the public. The main idea behind the Guidelines is that regular physical activity over months and years can produce long-term health benefits.

The information in the Guidelines is necessary because of the importance of physical activity to the health of Americans, whose current inactivity puts them at unnecessary risk. *Healthy People 2020* set objectives for increasing the level of physical activity in Americans over the decade from 2010 to 2020. Although the latest information shows some improvements in physical activity levels among American adults, only 26 percent of men, 19 percent of women, and 20 percent of adolescents report sufficient activity to meet the relevant aerobic and muscle-strengthening guidelines (see Figures 1-1 and 1-2).

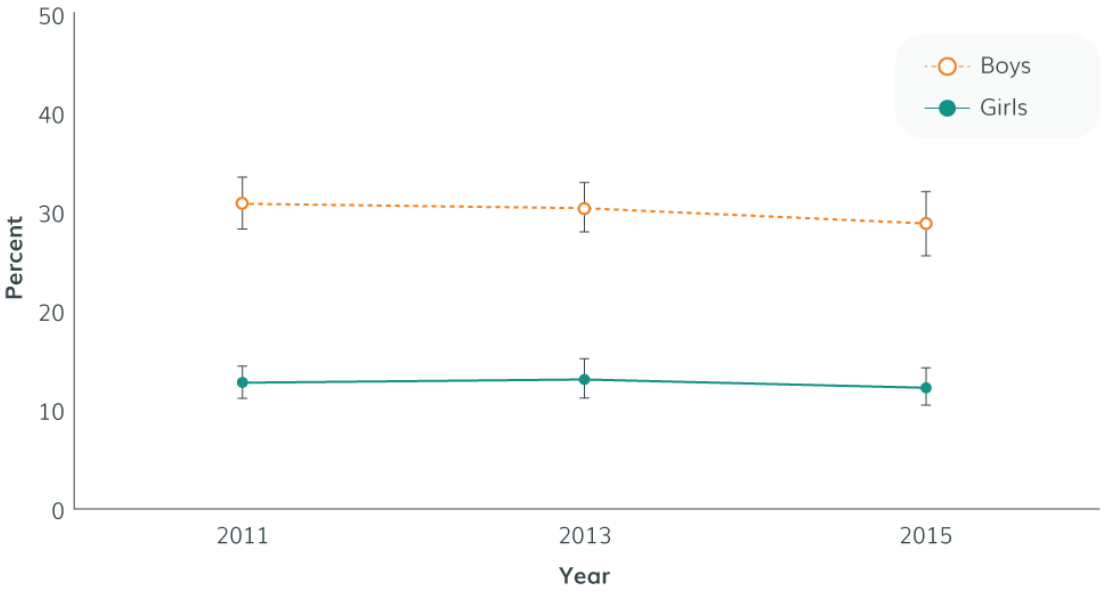
Figure 1-1. Percentage of U.S. Adults Ages 18 Years or Older Who Met the Aerobic and Muscle-Strengthening Guidelines, 2008–2016



Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey (NHIS).

Notes: Estimates are age-adjusted to the 2000 U.S. standard population using five age groups: 18–24 years, 25–34 years, 35–44 years, 45–64 years, and 65+ years. NHIS questions ask about frequency and duration of light-intensity to moderate-intensity and vigorous-intensity leisure-time physical activities, as well as the frequency of muscle-strengthening activities. Meeting the aerobic component of the *2008 Physical Activity Guidelines for Americans* is defined as reporting at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic physical activity a week, or an equivalent combination. Meeting the muscle-strengthening component is defined as reporting muscle-strengthening activities at least 2 days per week. Error bars represent upper and lower bounds of the 95% confidence interval.

Figure 1-2. Percentage of U.S. High School Students Who Met the Aerobic Physical Activity and Muscle-Strengthening Guidelines, 2011–2015



Source: Centers for Disease Control and Prevention, Youth Risk Behavior Surveillance System.

Notes: Meeting the aerobic component of the *2008 Physical Activity Guidelines for Americans* is defined as reporting at least 60 minutes of "any kind of physical activity that increases your heart rate and makes you breathe hard some of the time" on all days during the 7 days before the survey. Meeting the muscle-strengthening component is defined as reporting at least 3 days of "exercises to strengthen or tone your muscles" during the 7 days before the survey. Error bars represent upper and lower bounds of the 95% confidence interval.

The Development of the Physical Activity Guidelines

In 2008, HHS released the first edition of the *Physical Activity Guidelines for Americans*. It served as the first benchmark and primary, authoritative voice of the Federal Government for providing science-based guidance on physical activity, fitness, and health for Americans. The Guidelines provides a foundation for Federal recommendations and education for physical activity programs for Americans, including those at risk of chronic disease. Since 2008, HHS has reaffirmed the health benefits of physical activity in several publications.

In 2013, 5 years after the Guidelines was released, HHS developed the *Physical Activity Guidelines for Americans Midcourse Report: Strategies to Increase Physical Activity Among Youth*. This report built on the 2008 Guidelines for Americans by focusing on strategies to help youth achieve the recommended 60 minutes of daily physical activity in a variety of settings, including school, preschool and childcare, community, family and home, and primary care.

In 2015, HHS released *Step It Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities*. The Call to Action seeks to increase walking across the United States by calling for improved access to safe and convenient places to walk and wheelchair roll and to create a culture that supports these activities for people of all ages and abilities.

Because the evidence for the health benefits of a physically active lifestyle continued to grow rapidly, HHS began the process of developing a second edition of the *Physical Activity Guidelines for Americans* in December 2015. HHS called for nominations to the 2018 Physical Activity Guidelines Advisory Committee and followed a similar development process to those used for the *2008 Physical Activity Guidelines for Americans* and the *2015-2020 Dietary Guidelines for Americans*. In 2016, former HHS Secretary Sylvia Mathews Burwell appointed 17 members to the 2018 Physical Activity Guidelines Advisory Committee, an external scientific advisory committee chartered under the Federal Advisory Committee Act, as amended (Public Law 92-463, 5 U.S.C. App.). The Committee conducted an extensive analysis of the scientific information on physical activity and health and met periodically in public session to discuss their findings.

The Committee graded the evidence based on consistency and quality of the research literature. Evidence graded as strong or moderate was used as the basis for the Guidelines. The *2018 Physical Activity Guidelines Advisory Committee Scientific Report* and summaries of the Committee's public meetings are available at https://www.health.gov/PAGuidelines/.

When writing the Guidelines, HHS used the Advisory Committee's Scientific Report as its primary source but also considered comments from the public and government agencies. The Guidelines will be widely promoted through various communications strategies online and in print, such as the *Move Your Way* campaign materials for professionals and consumers, and partnerships with organizations that promote physical activity.

The Framework for the Physical Activity Guidelines for Americans

The *2018 Physical Activity Guidelines Advisory Committee Scientific Report* provided the content and conceptual underpinning for the Guidelines. Key elements of this framework are described in the following sections.

Disease Prevention and Health Promotion

The 2008 Advisory Committee Report and the 2008 Guidelines focused primarily on the disease prevention benefits of physical activity. The 2018 Scientific Report demonstrates that, in addition to disease prevention benefits, regular physical activity provides a variety of other benefits, including helping people sleep better, feel better, and perform daily tasks more easily. The 2018 Scientific Report also notes immediate benefits of physical activity in addition to those related to regular physical activity over months or years. This broader focus on both disease prevention and health promotion is embedded in the key guidelines for the amounts and types of physical activity that are provided for three age groups (children and adolescents, adults, and older adults), for women who are pregnant or postpartum, and for adults with chronic diseases or adults with disabilities.

Learn More

See Chapter 2. Physical Activity and Health for more information on the many health benefits of physical activity.

Strong evidence demonstrates that moderate-to-vigorous physical activity improves the quality of sleep in adults. It does so by reducing the length of time it takes to go to sleep and reducing the time one is awake after going to sleep and before rising in the morning. It also can increase the time in deep sleep and reduce daytime sleepiness.

Strong evidence from adults demonstrates that perceived quality of life is improved by regular physical activity. The Guidelines focuses on selected aspects of health-related quality of life, including both physical and mental or emotional health. It does not include other aspects of quality of life, such as those related to finances, relationships, or occupations.

Physical activity improves physical function among individuals of all ages, enabling them to conduct their daily lives with energy and without undue fatigue. This is true for older adults, for whom improved physical function reduces risk of falls and fall-related injuries and contributes to their ability to maintain independence. It is also true for young and middle-aged adults, as improved physical function helps them more easily accomplish the tasks of daily living, such as climbing stairs or carrying groceries.

In addition to improving physical function, physical activity may improve cognitive function among youth and adults. Aspects of cognitive function that may be improved include memory, attention, executive function (the ability to plan and organize; monitor, inhibit, or facilitate behaviors; initiate tasks; and control emotions), and academic performance among youth.

Timing of Benefits

A single session of moderate-to-vigorous physical activity can reduce blood pressure, improve insulin sensitivity, improve sleep, reduce anxiety symptoms, and improve some aspects of cognition on the day that it is performed. Most of these improvements become even larger with the regular performance of moderate-to-vigorous physical activity. Other benefits, such as disease risk reduction and improved physical function, accrue within days to weeks after consistently being more physically active.

Physical Activity Intensity

The Guidelines consider the intensity with which people do physical activity. Some activities are a higher intensity than others because they require more energy to do. For example, a person expends more energy walking briskly than slowly strolling.

Absolute rates of energy expenditure during physical activity are commonly described as light, moderate, or vigorous intensity. Energy expenditure is expressed by multiples of the metabolic equivalent of task (MET), where 1 MET is the rate of energy expenditure while sitting at rest.

- **Light-intensity activity** is non-sedentary waking behavior (see sidebar) that requires less than 3.0 METs; examples include walking at a slow or leisurely pace (2 mph or less), cooking activities, or light household chores.
- **Moderate-intensity activity** requires 3.0 to less than 6.0 METs; examples include walking briskly (2.5 to 4 mph), playing doubles tennis, or raking the yard.
- **Vigorous-intensity activity** requires 6.0 or more METs; examples include jogging, running, carrying heavy groceries or other loads upstairs, shoveling snow, or participating in a strenuous fitness class. Many adults do no vigorous-intensity physical activity.

Learn More

Appendix 1 provides a detailed explanation of MET-minutes, a unit useful for describing the energy expenditure of a specific physical activity.

Levels of Physical Activity

Throughout the Guidelines, reference is made to four levels of aerobic physical activity: inactive, insufficiently active, active, and highly active. This classification for adults is useful because these categories are related to how much health benefit a person obtains at a given level and how to become more active. The focus on aerobic physical activity for the levels should not be interpreted to suggest that other types of activity, such as muscle strengthening, are less important.

- **Inactive** is not getting any moderate- or vigorous-intensity physical activity beyond basic movement from daily life activities.

- **Insufficiently active** is doing some moderate- or vigorous-intensity physical activity but less than 150 minutes of moderate-intensity physical activity a week or 75 minutes of vigorous-intensity physical activity or the equivalent combination. This level is less than the target range for meeting the key guidelines for adults.
- **Active** is doing the equivalent of 150 minutes to 300 minutes of moderate-intensity physical activity a week. This level meets the key guideline target range for adults.
- **Highly active** is doing the equivalent of more than 300 minutes of moderate-intensity physical activity a week. This level exceeds the key guideline target range for adults.

The Relationship Between Sedentary Behavior and Physical Activity

Research on the health effects of sedentary behavior is a relatively new area. Therefore, it was not addressed in 2008. Sedentary behavior has received an increasing amount of attention as a public health problem because it appears to have health risks, and it is a highly prevalent behavior in the U.S. population. Data collected by devices in the U.S. National Health and Nutrition Examination Survey (NHANES) indicate that children and adults spend approximately 7.7 hours per day (55% of their monitored waking time) being sedentary. Thus, the potential population health impact of sedentary behavior is substantial.

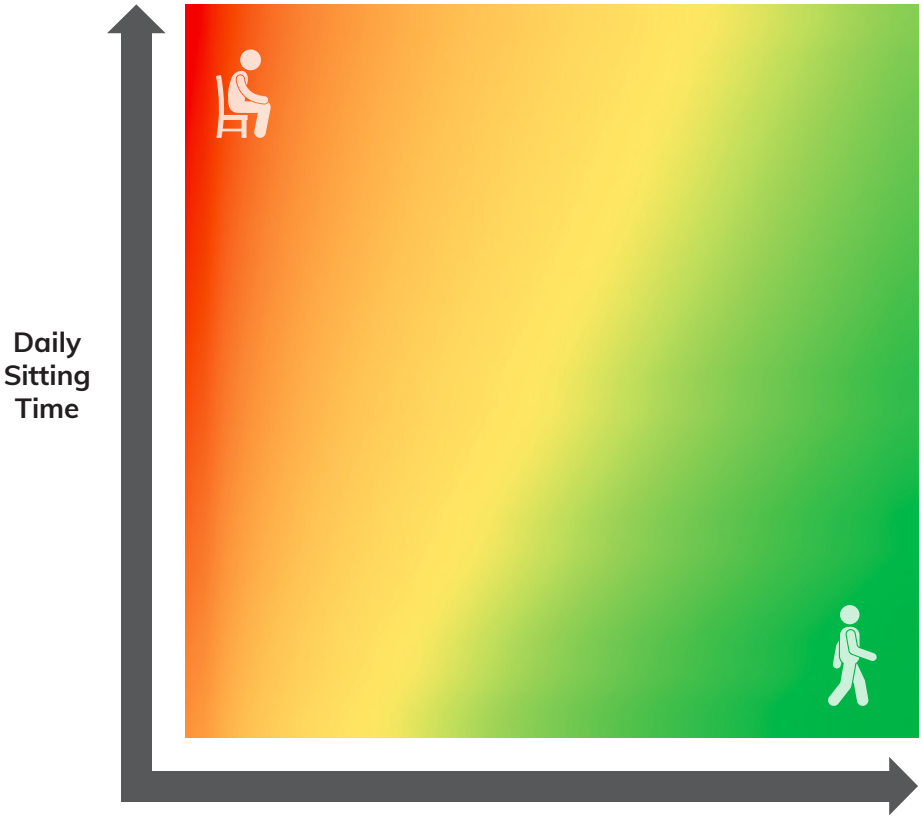
The 2018 Advisory Committee found a strong relationship between time in sedentary behavior and the risk of all-cause mortality and cardiovascular disease mortality in adults. However, the literature was insufficient to recommend a specific target for adults or youth for how many times during the day sedentary time should be interrupted with physical activity. Furthermore, a specific healthy target for total sedentary behavior time could not be determined. This was because the risk related to sedentary behavior was dependent upon the amount of moderate-to-vigorous physical activity performed. This relationship is illustrated in Figure 1-3.

What Is Sedentary Behavior?

In general, *sedentary behavior* refers to any waking behavior characterized by a low level of energy expenditure (less than or equal to 1.5 METs) while sitting, reclining, or lying. The Guidelines operationalizes the definition of sedentary behavior to include self-reported sitting (leisure-time, occupational, and total), television (TV) viewing or screen time, and low levels of movement measured by devices that assess movement or posture. Standing is another activity with low energy expenditure, but it is distinct from sedentary behavior in how it affects health.

The figure shows moderate-to-vigorous physical activity in minutes on the horizontal axis and daily sitting time in hours on the vertical axis. Red represents higher risk of all-cause mortality, and green represents lower risk of all-cause mortality. Orange and yellow represent transitional decreases in risk of all-cause mortality.

Figure 1-3. Relationship Among Moderate-to-Vigorous Physical Activity, Sitting Time, and Risk of All-Cause Mortality in Adults



Risk of all-cause mortality decreases as one moves from red to green.

Source: This heat map is adapted from data found in Ekelund U, Steene-Johannessen J, Brown WJ. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonized meta-analysis of data from more than 1 million men and women. Lancet. 2016;388:1302-1310. doi:10.1016/S0140-6736(16)30370-1.

At the greatest time spent sitting (the top), the risk of all-cause mortality begins to decrease (color becomes orange) even with small additions of moderate-to-vigorous physical activity. At the greatest volume of moderate-to-vigorous physical activity, the risk is low even for those who sit the most (upper right corner). The best currently available estimate of this volume is about 60 to 75 minutes per day of moderate-intensity activities, or 30 to 40 minutes per day of vigorous-intensity activities. This high volume of moderate-to-vigorous physical activity is achieved by a very small proportion of the population.

At the lowest volume of moderate-to-vigorous physical activity (the left side of the figure), the risk of all-cause mortality increases as time spent sitting increases. This suggests that for inactive adults, replacing sitting time with light-intensity physical activities reduces the risk of all-cause mortality. Although the risk of all-cause mortality is reduced as the time spent in sedentary behavior is reduced, even adults who sit the least have an

elevated risk if they perform no moderate-to-vigorous physical activity (lower left corner).

The figure illustrates three main conclusions:

- High volumes of moderate-to-vigorous physical activity appear to remove the excess risk of all-cause mortality that is associated with high volumes of sitting.
- Very low time spent sitting reduces, but does not eliminate, the risk of no moderate-to-vigorous physical activity.
- Given the high levels of sitting and low levels of physical activity in the population, most people would benefit from both increasing moderate-to-vigorous physical activity and reducing time spent sitting.

Progressing Toward and Beyond the Physical Activity Target

The 2008 Advisory Committee reported that inactive people can achieve substantial health gains by increasing their activity level even if they do not reach the target range. Since 2008, substantially more information documents the value of reducing inactivity even if youth or adults do not achieve the recommended target range.

Bouts, or episodes, of moderate-to-vigorous physical activity of any duration may be included in the daily accumulated total volume of physical activity. The *2008 Physical Activity Guidelines for Americans* recommended accumulating moderate-to-vigorous physical activity in bouts of 10 minutes or more because not enough evidence was available to support the value of bouts less than 10 minutes in duration. The 2018 Advisory Committee concluded that bouts of any length contribute to the health benefits associated with the accumulated volume of physical activity. Even a brief episode of physical activity like climbing up a few flights of stairs counts.

Bouts of any length contribute to the health benefits associated with the accumulated volume of physical activity.

What Does "Progressing Toward Targets" Mean for People's Daily Lives?

The risk of injury to bones, muscles, and joints is directly related to the gap between a person's usual level of activity and a new level of activity. When amounts of physical activity need to be increased to meet the key guidelines or personal goals, physical activity should be increased gradually over time, no matter what the person's current level of physical activity. This concept is addressed more fully in Chapter 7. Active and Safe.

For people who are inactive, that is, people who do not do any moderate- or vigorous-intensity physical activity beyond basic movement from daily life activities:

- Reducing sedentary behavior has health benefits. It reduces the risk of all-cause mortality, cardiovascular disease incidence and mortality, and the incidence of type 2 diabetes and some cancers. A good first step is to replace sedentary behavior with light-intensity physical activity. Previously, evidence that light-intensity physical activity could provide health benefits was not sufficient to support a recommendation.
- No matter how much time they spend in sedentary behavior or light-intensity activity, inactive people can reduce their health risks by gradually increasing their moderate-intensity physical activity.

For people who are insufficiently active, that is, people who do some moderate- or vigorous-intensity physical activity, but who do not yet meet the key guidelines target range (150 to 300 minutes a week of moderate-intensity physical activity for adults):

- Even small increases in moderate-intensity physical activity provide health benefits. There is no threshold that must be exceeded before benefits begin to occur.
- Greater benefits can be achieved by reducing sedentary behavior, increasing moderate-intensity physical activity, or a combination of both.
- For any given increase in moderate-to-vigorous physical activity, the relative gain in benefits is greater for insufficiently active people than for people who are already meeting the key guidelines.

For people who are active, that is, people who already meet the key guidelines (150 to 300 minutes a week of moderate-intensity physical activity for adults):

- Although those within the target range already have substantial benefits from their current volume of physical activity, more benefits can be gained by doing additional moderate-to-vigorous physical activity or reducing sedentary behavior.

For people who are highly active, that is, people who do more than the equivalent of 300 minutes a week of moderate-intensity physical activity:

- These people should maintain or increase their activity level by doing a variety of activities.

Health Benefits Versus Other Reasons to Be Physically Active

Although the Guidelines focuses on the health benefits of physical activity, these benefits are not the only reason why people are active. Physical activity gives people a chance to have fun, be with friends and family, enjoy the outdoors, and improve fitness so they can more easily participate in additional physical activity or sporting events. Some people are active because it helps them feel more energetic and healthier.

Nothing in the Guidelines is intended to mean that health benefits are the only reason to do physical activity. People should be physically active for any and all reasons that are meaningful for them.

Health-Related Versus Performance-Related Fitness

Promoting health, reducing risk of chronic disease, and promoting health-related fitness—particularly cardiovascular and muscular fitness—are the primary focus of the Guidelines. People can gain this kind of fitness by doing the amounts and types of activities recommended in the key guidelines for each age group and population.

The types and amounts of activity necessary to improve performance-related fitness are not addressed in the Guidelines. Athletes need this kind of fitness when they compete. Medical screening issues for competitive athletes also are outside the scope of the Guidelines.

People who are interested in training programs to increase performance-related fitness should seek advice from other sources. Generally, these people do much more activity than required to meet the targets in the key guidelines.

Lifespan Approach

The best way to be physically active is to be active for life. Therefore, the Guidelines takes a lifespan approach and provides recommendations for three broad age groups—children and adolescents, adults, and older adults.

The 2008 Guidelines provided recommendations for children, adolescents, and adults, covering individuals ages 6 years and older. Recent research has provided support for recommendations for children ages 3 through 5 years, and so the 2018 Guidelines are designed for those ages 3 years and older. Physical activity is necessary for healthy growth and development of infants and young children of all ages.

Putting the Guidelines Into Practice

Assessing Whether Physical Activity Programs Are Consistent With the Guidelines

Programs that provide opportunities for physical activity, such as classes or community activities, can help people meet the key guidelines. These programs do not have to provide all, or even most, of the recommended weekly activity. For example, a mall walking program for older adults may meet only once a week yet provide useful amounts of activity, as long as people get the rest of their weekly recommended activity on other days.

Programs that are consistent with the *Physical Activity Guidelines for Americans:*

- Provide advice and education consistent with the Guidelines;
- Add episodes of activity that count toward meeting the key guidelines; and
- May also include activities, such as stretching or warming up and cooling down, whose health benefits are not yet proven but that are often used in effective physical activity programs.

The Importance of Understandable Guidelines

HHS has tried to keep the *Physical Activity Guidelines for Americans* straightforward and understandable, while remaining consistent with complex scientific information. In each chapter, the key guidelines are set apart from the text to identify the most important information to disseminate to the public. The messages contained in the Guidelines should be communicated to the public and to anyone involved in promoting physical activity.

Taking Action: Increasing Physical Activity Levels of Americans

Action is needed at individual, community, and societal levels to help Americans become physically active. Regular physical activity needs to be made the safe and easy choice for Americans. To most effectively increase physical activity levels, evidence-based strategies should be used. This means that researchers or practitioners have tested the strategy and shown that it can increase physical activity.

A review of the science by the 2018 Physical Activity Guidelines Advisory Committee shows that many evidence-based strategies can be used to promote and support physical activity. Some strategies involve working with people one-on-one or in small groups to change their physical activity. Other strategies can be implemented more broadly at the community level through programs, practices, and policies that make physical activity an easy choice.

Chapter 8. Taking Action: Increasing Physical Activity Levels of Americans highlights several evidence-based strategies that focus on individuals and on communities. Because improving physical activity across the country will require the efforts of individuals and many sectors of society, the chapter closes with some potential steps individuals and groups can take to increase physical activity levels.

Chapter 2. Physical Activity and Health

All Americans should engage in regular physical activity to improve overall health and fitness and to prevent negative health outcomes. The benefits of physical activity occur in generally healthy people of all ages, in people at risk of developing chronic diseases, and in people with chronic conditions or disabilities. This chapter describes an overview of research findings on physical activity and health. The accompanying box provides a summary of these benefits.

Physical activity affects many health conditions, and the specific amounts and types of activity that benefit each condition vary. In developing public health guidelines, the challenge is to integrate scientific information across all health benefits and identify a critical range of physical activity that appears to have an effect across the health benefits. One consistent finding from research studies is that once the health benefits from physical activity begin to accumulate, additional amounts of activity provide additional benefits.

Some health benefits occur immediately after an episode of physical activity. Other benefits begin with as little as 60 minutes a week. Research shows that a total amount of at least 150 minutes a week of moderate-intensity aerobic activity, such as brisk walking, consistently reduces the risk of many chronic diseases and other adverse health outcomes.

The Health Benefits of Physical Activity—Major Research Findings

- Regular moderate-to-vigorous physical activity reduces the risk of many adverse health outcomes.
- Some physical activity is better than none.
- For most health outcomes, additional benefits occur as the amount of physical activity increases through higher intensity, greater frequency, and/or longer duration.
- Substantial health benefits for adults occur with 150 to 300 minutes a week of moderate-intensity physical activity, such as brisk walking. Additional benefits occur with more physical activity.
- Both aerobic and muscle-strengthening physical activity are beneficial.
- Health benefits occur for children and adolescents, young and middle-aged adults, older adults, and those in every studied racial and ethnic group.
- The health benefits of physical activity occur for people with chronic conditions or disabilities.
- The benefits of physical activity generally outweigh the risk of adverse outcomes or injury.

Examining the Relationship Between Physical Activity and Health

In many studies covering a wide range of issues, researchers have focused on exercise as well as on the more broadly defined concept of physical activity.

Studies have examined the role of physical activity in many groups—men and women, children, adolescents, adults, older adults, people with chronic conditions and disabilities, and women during pregnancy and the postpartum period. These studies have focused on the role that physical activity plays in many health outcomes, including:

- All-cause mortality;
- Diseases such as coronary heart disease, stroke, cancer at multiple sites, type 2 diabetes, obesity, hypertension, and osteoporosis;
- Risk factors for disease, such as overweight or obesity, hypertension, and high blood cholesterol;
- Physical fitness, such as aerobic capacity and muscle strength and endurance;
- Functional capacity, or the ability to engage in activities needed for daily living;
- Brain health and conditions that affect cognition, such as depression and anxiety, and Alzheimer's disease; and
- Falls or injuries from falls.

These studies have also prompted questions as to what type of physical activity and how much is needed for various health benefits. To answer this question, investigators have studied three main kinds of physical activity—aerobic, muscle strengthening, and bone strengthening. Investigators have also studied balance and flexibility activities.

Aerobic Activity

In this kind of physical activity (also called an *endurance activity* or *cardio activity*), the body's large muscles move in a rhythmic manner for a sustained period of time. Brisk walking, running, bicycling, jumping rope, and swimming are all examples. Aerobic activity causes a person's heart to beat faster, and they will breathe harder than normal.

Physical Activity, Exercise, and Health

Physical activity refers to any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level. In the Guidelines, *physical activity* generally refers to the subset of physical activity that enhances health. *Exercise* is a form of physical activity that is planned, structured, repetitive, and performed with the goal of improving health or fitness. Although all exercise is physical activity, not all physical activity is exercise.

Health is a human condition with physical, social, and psychological dimensions, each characterized on a continuum with positive and negative poles. Positive health is associated with a capacity to enjoy life and to withstand challenges; it is not merely the absence of disease. Negative health is associated with illness, and in the extreme, with premature death.

Learn More

See Chapter 3. Active Children and Adolescents, Chapter 4. Active Adults, and Chapter 5. Active Older Adults for more information about the types and amounts of physical activity needed for various health benefits.

Aerobic physical activity has three components:

- **Intensity,** or how hard a person works to do the activity. The intensities most often studied are moderate (equivalent in effort to brisk walking) and vigorous (equivalent in effort to running or jogging);
- **Frequency,** or how often a person does aerobic activity; and
- **Duration,** or how long a person does an activity in any one session.

Although these components make up an aerobic physical activity profile, research has shown that the total amount of physical activity (minutes of moderate-intensity physical activity in a week, for example) is more important for achieving health benefits than is any one component (frequency, intensity, or duration). All time spent in moderate- or vigorous-intensity physical activity counts toward meeting the key guidelines.

Muscle-Strengthening Activity

This kind of activity, which includes resistance training and weight lifting, causes the body's muscles to work or hold against an applied force or weight. These activities often involve lifting relatively heavy objects, such as weights, multiple times to strengthen various muscle groups. Muscle-strengthening activity can also be done by using elastic bands or body weight for resistance (climbing a tree or doing push-ups, for example).

Muscle-strengthening activity has three components:

- **Intensity,** or how much weight or force is used relative to how much a person is able to lift;
- **Frequency,** or how often a person does muscle-strengthening activity; and
- **Sets and repetitions,** or how many times a person does the muscle-strengthening activity, like lifting a weight or doing a push-up (comparable to duration for aerobic activity).

The effects of muscle-strengthening activity are limited to the muscles doing the work. It is important to work all the major muscle groups of the body—the legs, hips, back, abdomen, chest, shoulders, and arms.

Bone-Strengthening Activity

This kind of activity (sometimes called *weight-bearing* or *weight-loading activity*) produces a force on the bones of the body that promotes bone growth and strength. This force is commonly produced by impact with the ground. Examples of bone-strengthening activity include jumping jacks, running, brisk walking, and weight-lifting exercises. As these examples illustrate, bone-strengthening activities can also be aerobic and muscle strengthening.

Balance Activities

These kinds of activities can improve the ability to resist forces within or outside of the body that cause falls while a person is stationary or moving. Walking backward, standing on one leg, or using a wobble board are examples of balance activities. Strengthening muscles of the back, abdomen, and legs also improves balance.

Flexibility Activities

These kinds of activities enhance the ability of a joint to move through the full range of motion. Stretching exercises are effective in increasing flexibility, and thereby can allow people to more easily do activities that require greater flexibility.

The Health Benefits of Physical Activity

Research demonstrates that participating in regular moderate-to-vigorous physical activity provides many health benefits. These benefits are summarized in Table 2-1. Some benefits of physical activity can be achieved immediately, such as reduced feelings of anxiety, reduced blood pressure, and improvements in sleep, some aspects of cognitive function, and insulin sensitivity. Other benefits, such as increased cardiorespiratory fitness, increased muscular strength, decreases in depressive symptoms, and sustained reduction in blood pressure, require a few weeks or months of participation in physical activity. Physical activity can also slow or delay the progression of chronic diseases, such as hypertension and type 2 diabetes. Benefits persist with continued physical activity.

The health benefits of physical activity are seen in children and adolescents, young and middle-aged adults, older adults, women and men, people of different races and ethnicities, and people with chronic conditions or disabilities. The health benefits of physical activity are generally independent of body weight. Adults of all sizes and shapes gain health and fitness benefits by being habitually physically active. The benefits of physical activity also outweigh the risk of injury and heart attacks, two concerns that may prevent people from becoming physically active.

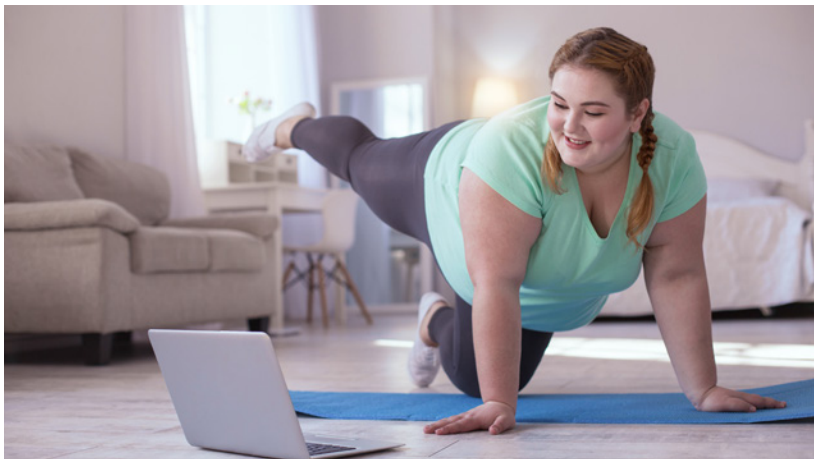


Table 2-1. Health Benefits Associated With Regular Physical Activity

Children and Adolescents
■ Improved bone health (ages 3 through 17 years) ■ Improved weight status (ages 3 through 17 years) ■ Improved cardiorespiratory and muscular fitness (ages 6 through 17 years) ■ Improved cardiometabolic health (ages 6 through 17 years) ■ Improved cognition (ages 6 to 13 years)* ■ Reduced risk of depression (ages 6 to 13 years)
Adults and Older Adults
■ Lower risk of all-cause mortality ■ Lower risk of cardiovascular disease mortality ■ Lower risk of cardiovascular disease (including heart disease and stroke) ■ Lower risk of hypertension ■ Lower risk of type 2 diabetes ■ Lower risk of adverse blood lipid profile ■ Lower risk of cancers of the bladder, breast, colon, endometrium, esophagus, kidney, lung, and stomach ■ Improved cognition* ■ Reduced risk of dementia (including Alzheimer's disease) ■ Improved quality of life ■ Reduced anxiety ■ Reduced risk of depression ■ Improved sleep ■ Slowed or reduced weight gain ■ Weight loss, particularly when combined with reduced calorie intake ■ Prevention of weight regain following initial weight loss ■ Improved bone health ■ Improved physical function ■ Lower risk of falls (older adults) ■ Lower risk of fall-related injuries (older adults)

Note: The Advisory Committee rated the evidence of health benefits of physical activity as strong, moderate, limited, or grade not assignable. Only outcomes with strong or moderate evidence of effect are included in this table.

*See Table 2-3 for additional components of cognition and brain health.

The Role of Fitness in Health

Physical fitness is an important factor in the ability of people to perform routine daily activities and an important issue from a public health perspective. *Physical fitness* has been defined as "the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and respond to emergencies."

Physical fitness has multiple components, including cardiorespiratory fitness (endurance or aerobic power), musculoskeletal fitness, flexibility, balance, and speed of movement (see Table 2-2).

Table 2-2. Components of Physical Fitness

Cardiorespiratory Fitness	The ability to perform large-muscle, whole-body exercise at moderate-to-vigorous intensities for extended periods of time.
Musculoskeletal Fitness	The integrated function of muscle strength, muscle endurance, and muscle power to enable performance of work.
Flexibility	The range of motion available at a joint or group of joints.
Balance	The ability to maintain equilibrium while moving or while stationary.
Speed	The ability to move the body quickly.

A substantial body of research has examined the relationship between physical fitness—cardiorespiratory fitness and, in some cases, musculoskeletal fitness—and health outcomes. The findings show that greater physical fitness is associated with reduced all-cause mortality and cardiovascular disease mortality and reduced risk of developing a wide range of chronic diseases, such as type 2 diabetes and hypertension. To date, most studies were done in men, but new data indicate these relationships also exist in women.

Physical activity and physical fitness are related to each other, and both provide important health benefits. Increases in the amount and intensity of physical activity typically produce increases in physical fitness, particularly in those who are less physically active. The available evidence suggests that physical activity and physical fitness interact in their effects on a variety of health outcomes.

Some possible ways that fitness and health outcomes may relate to physical activity are:

- Physical activity leads to improvements in physical fitness, and physical fitness causes improvements in health outcomes;
- Physical fitness may modify the amount of the effect that physical activity has on health outcomes; or
- Physical activity can lead to improved physical fitness as a health outcome.

The Beneficial Effects of Increasing Physical Activity: It Is About Overload, Progression, and Specificity

Overload is the physical stress placed on the body when physical activity is greater in amount or intensity than usual. The body's structures and functions respond and adapt to these stresses. For example, aerobic physical activity places a stress on the cardiorespiratory system and muscles, requiring the lungs to move more air and the heart to pump more blood and deliver it to the working muscles. This increase in demand increases the efficiency and capacity of the lungs, heart, circulatory system, and exercising muscles. In the same way, muscle-strengthening and bone-strengthening activities overload muscles and bones, making them stronger.

Progression is closely tied to overload. Once a person reaches a certain fitness level, he or she is able to progress to higher levels of physical activity by continued overload and adaptation. Small, progressive changes in overload help the body adapt to the additional stresses while minimizing the risk of injury.

Specificity means that the benefits of physical activity are specific to the body systems that are doing the work. For example, the physiologic benefits of walking are largely specific to the lower body and the cardiovascular system. Push-ups primarily benefit the muscles of the chest, shoulders, and upper arms.

The following sections provide more detail on what is known from research studies about the specific health benefits of physical activity.

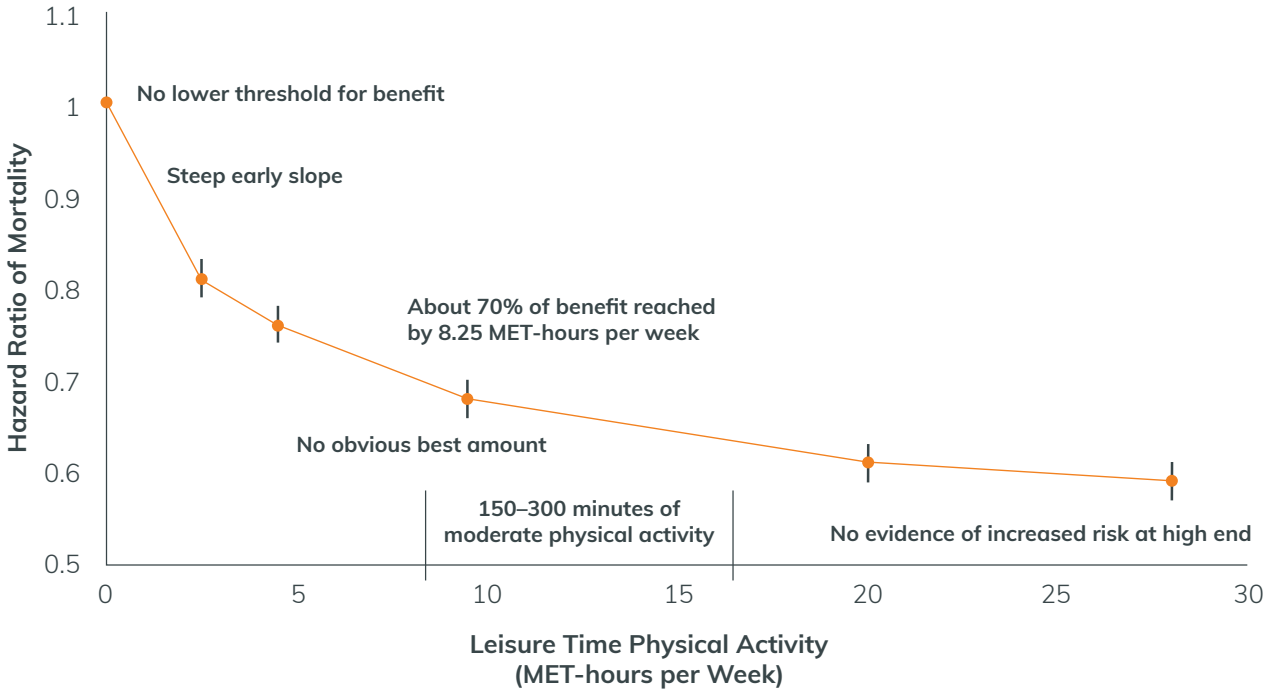
All-Cause Mortality

Strong scientific evidence shows that physical activity delays death from all causes. This includes the leading causes of death, such as heart disease and some cancers, as well as other causes of death. This effect is remarkable in two ways:

- First, only a few lifestyle choices have as large an effect on mortality as physical activity. It has been estimated that people who are physically active for approximately 150 minutes a week have a 33 percent lower risk of all-cause mortality than those who are not physically active.
- Second, it is not necessary to do large amounts of activity or vigorous-intensity activity to reduce the risk of all-cause mortality. Benefits start to accumulate with any amount of moderate- or vigorous-intensity physical activity.

Research clearly demonstrates the importance of avoiding inactivity. Even low amounts of moderate-to-vigorous intensity physical activity reduce the risk of all-cause mortality. As Figure 2-1 shows, a large benefit occurs when a person moves from being inactive to being insufficiently active. The relative risk of all-cause mortality continues to decline as people become even more physically active. Even at very high levels of physical activity (3 to 5 times the key guidelines), there is no evidence of increased risk.

Figure 2-1. Relationship of Moderate-to-Vigorous Physical Activity to All-Cause Mortality



Source: Adapted from data found in Moore SC, Patel AV, Matthews CE. Leisure time physical activity of moderate to vigorous intensity and mortality: a large pooled cohort analysis. PLoS Med. 2012;9(11):e1001335. doi:10.1371/journal.pmed.1001335.

All adults can gain this health benefit of physical activity, no matter their age, sex, race, or ethnicity. Physically active people with all body weights (normal weight, overweight, obesity) also have lower risk of all-cause mortality than do inactive people.

Cardiorespiratory Health

The benefits of physical activity on cardiorespiratory health are some of the most extensively documented of all the health benefits. Cardiorespiratory health involves the health of the heart, lungs, and blood vessels.

Heart disease and stroke are two of the leading causes of death in the United States. Risk factors that increase the likelihood of cardiovascular diseases include smoking, hypertension, type 2 diabetes, and high levels of certain blood lipids (such as low-density lipoprotein [LDL] cholesterol). Low cardiorespiratory fitness also is a risk factor for heart disease.

Physical activity strongly reduces both the risk of dying from cardiovascular disease and the risk of developing cardiovascular disease, including heart attack, stroke, and heart failure. Regularly active adults have lower rates of heart disease and stroke and have lower blood pressure, better blood lipid profiles, and better physical fitness. Significant reductions in risk of cardiovascular disease occur at activity levels equivalent to 150 minutes a week of moderate-intensity physical activity. As with all-cause mortality, benefits begin with less than 150 minutes a week, and strong evidence shows that greater amounts of physical activity result in even further reductions in risk of cardiovascular disease.

Regular physical activity can greatly affect blood pressure, and effects can be immediate. People who have normal blood pressure benefit because the risk of developing hypertension is reduced. People who have hypertension also benefit because systolic and diastolic blood pressure are lowered. Both aerobic and muscle-strengthening physical activity are recommended to improve blood pressure. Even physical activity at levels below the key guidelines tends to benefit blood pressure, and engaging in more physical activity can have even greater benefits.

Everyone, including children and adolescents, can gain the cardiovascular health benefits of physical activity. The amount of physical activity that provides favorable cardiorespiratory health and fitness outcomes is similar for men and women of all ages, including older people, as well as for adults of various races and ethnicities. Aerobic exercise also improves cardiorespiratory fitness in people with disabilities, including people who have lost the use of one or both legs and those with multiple sclerosis, stroke, and spinal cord injury.

Cardiometabolic Health and Weight Management

Cardiometabolic health is a term that encompasses cardiovascular diseases and metabolic diseases, such as type 2 diabetes. Cardiovascular disease and metabolic disease share a number of risk factors, and reducing risk of one can reduce risk for the other. Cardiometabolic health and weight status are also closely related issues and are often considered together.

Type 2 Diabetes and Cardiometabolic Health

Regular physical activity strongly reduces the risk of developing type 2 diabetes in people of all body sizes. Physical activity can have an additive benefit for reducing risk of type 2 diabetes because physical activity reduces the risk of excessive weight gain, an independent risk factor for type 2 diabetes. Adults who regularly engage in aerobic activity of at least moderate intensity have a significantly lower risk of developing type 2 diabetes than do inactive adults. These benefits begin to accrue at levels of physical activity below the key guideline of 150 to 300 minutes a week, and additional amounts of moderate- or vigorous-intensity physical activity seem to lower risk even further. Insulin sensitivity can be improved with just a single bout of physical activity. In addition, physical activity helps control blood glucose in people who already have type 2 diabetes.

Physical activity improves cardiometabolic health in children and adolescents, as well as in adults. Specifically, regular physical activity contributes to lower plasma triglycerides and insulin levels and may also play a role in improving high-density lipoprotein (HDL) cholesterol and blood pressure.

Can High-Intensity Interval Training Be Helpful for Cardiovascular Health?

Most of the benefits of physical activity have been studied with moderate- or vigorous-intensity aerobic activity. Recent research has examined high-intensity interval training (HIIT), which may provide similar reductions in cardiovascular disease risk factors as those observed with continuous moderate-intensity physical activity. HIIT is a form of interval training that consists of alternating short periods of maximal-effort exercise with less intense recovery periods. This type of exercise can improve insulin sensitivity, blood pressure, and body composition in adults. Interestingly, adults with overweight or obesity and those at higher risk of cardiovascular disease and type 2 diabetes tend to have greater cardiovascular benefits when doing HIIT compared to normal-weight or healthy adults.

Weight Management

Physical activity and caloric intake both must be considered when trying to control body weight. Because of its role in energy balance, physical activity is a critical factor in determining whether a person can maintain a healthy body weight, lose excess body weight, or maintain successful weight loss.

Strong scientific evidence shows that physical activity helps people maintain a stable weight over time and can reduce the risk of excessive weight gain and the incidence of obesity. People vary a great deal in how much physical activity they need to achieve and maintain a healthy weight. Some need more physical activity than others to maintain a healthy body weight, to lose weight, or to keep weight off once it has been lost. Many people need more than the equivalent of 150 minutes of moderate-intensity activity a week to maintain their weight. The relationship between physical activity and prevention of weight gain is most often observed with moderate- or vigorous-intensity aerobic physical activity. Muscle-strengthening activities help promote weight maintenance, although not to the same degree as aerobic activity.

People who want to lose a substantial amount of weight (more than 5 percent of body weight) and people who are trying to keep a significant amount of weight off once it has been lost may need to do more than 300 minutes of moderate-intensity activity a week to meet weight-control goals. Muscle-strengthening activities can also help maintain lean body mass during weight loss. Combining both caloric restriction and physical activity tend to be most beneficial for weight loss rather than just caloric restriction or just physical activity.

People with overweight or obesity tend to experience the same benefits of physical activity as those with normal weight. However, there are specific exceptions. Compared to women with normal weight, women with overweight or obesity see a greater risk reduction for developing endometrial cancer and a greater risk reduction of breast cancer-specific mortality as a result of being more physically active.

Regular physical activity also helps control body weight or reduce body fat in children and adolescents ages 3 through 17 years. Throughout childhood and adolescence, higher levels of physical activity are associated with smaller increases in body weight and adiposity.

Bone and Musculoskeletal Health

Bones, muscles, and joints support the body and help it move. Healthy bones, joints, and muscles are critical to the ability to do daily activities without physical limitations such as climbing stairs, working in the garden, or carrying a small child.

Progressive muscle-strengthening activities preserve or increase muscle mass, strength, and power. Greater amounts (through higher frequency, heavier weights, or more resistance) improve muscle function to a greater degree. Improvements occur in children and adolescents as well as in younger and older adults. Resistance exercises also improve muscular strength in persons with conditions such as stroke, multiple sclerosis, cerebral palsy, and spinal cord injury. Though aerobic activity does not increase muscle mass in the same way that muscle-strengthening activities do, it may also help slow the loss of muscle with aging.

Preserving bone, joint, and muscle health is essential with increasing age. Studies show that the frequent decline in bone density that happens during aging can be slowed with regular physical activity. These effects are seen in people who participate in aerobic, muscle-strengthening, and bone-strengthening physical activity programs of moderate or vigorous intensity. The range of total physical activity for these benefits varies widely. Important changes seem to begin at 90 minutes a week.

Building strong, healthy bones is also important for children and adolescents. Along with having a healthy diet that includes adequate calcium and vitamin D, physical activity is critical for bone development in youth. Children and adolescents ages 3 through 17 years who are physically active (such as by running, jumping, and doing other bone-strengthening activities) have higher bone mass, improved bone structure, and greater bone strength.

Regular physical activity also helps people with osteoarthritis or other rheumatic conditions affecting the joints. Participation in 150 minutes a week of moderate-intensity aerobic physical activity plus muscle-strengthening activity improves pain management, function, and quality of life. Up to 10,000 steps per day does not appear to worsen the progression of osteoarthritis. Very high levels of physical activity, however, may have extra risks. People who participate in very high levels of high-impact physical activity—such as elite or professional athletes—have a higher risk of hip and knee osteoarthritis, mostly due to the risk of injury involved in competing in some sports.

Functional Ability and Fall Prevention

Physical function, or *functional ability*, is the capacity of a person to perform tasks or behaviors that enable him or her to carry out everyday activities, such as climbing stairs, or to fulfill basic life roles, such as personal care, grocery shopping, or playing with grandchildren. Loss of functional ability is referred to as *functional limitation*. Middle-aged and older adults who are physically active have lower risk of functional limitations than do inactive adults. Physical activity can prevent or delay the onset of substantial functional or role limitations. Older adults who already have functional limitations also benefit from regular physical activity.

Hip fracture is a serious health condition that can have life-changing negative effects for many older people. Physically active people, especially women, appear to have a lower risk of hip fracture than do inactive people. Among older adults, physical activity reduces the risk of falling and injuries from falls. Research demonstrates that multicomponent physical activity programs are most successful at reducing falls and injuries. These programs commonly include muscle-strengthening activities and balance training and may also include gait and coordination training, physical function training, and moderate-intensity activities, such as walking. It is important to note that doing only low-intensity walking does not seem to reduce the risk of fall-related injuries

and fractures. Older adults, including those with a variety of health conditions such as Parkinson's disease, stroke, and hip fracture, and those with frailty obtain benefits from multicomponent physical activities.

Brain Health

Brain health can be defined in many ways, but the Guidelines focuses on the following areas:

- Youth—brain maturation and development and academic achievement;
- Older adults—dementia and cognitive impairment; and
- Across the lifespan—cognition, anxiety and depression, quality of life, and sleep.

Learn More

See Chapter 6. Additional Considerations for Some Adults for a discussion of physical activity and brain health in conditions such as Parkinson's disease, stroke, and spinal cord injury.

Some of the benefits of physical activity on brain health occur immediately after a session of moderate-to-vigorous physical activity (acute effect), such as reduced feelings of state anxiety (short-term anxiety), improved sleep, and improved aspects of cognitive function. With regular physical activity (habitual effect), improvements are seen in trait anxiety (long-term anxiety), deep sleep, and components of executive function (including the ability to plan and organize; monitor, inhibit, or facilitate behaviors; initiate tasks; and control emotions). Table 2-3 describes the benefits of physical activity for brain health.

Table 2-3. The Benefits of Physical Activity for Brain Health

Outcome	Population	Benefit	Acute	Habitual
Cognition	Children ages 6 to 13 years	Improved cognition (performance on academic achievement tests, executive function, processing speed, memory)	●	●
	Adults	Reduced risk of dementia (including Alzheimer's disease)		●
	Adults older than age 50 years	Improved cognition (executive function, attention, memory, crystallized intelligence,* processing speed)		●
Quality of life	Adults	Improved quality of life		●
Depressed mood and depression	Children ages 6 to 17 years and adults	Reduced risk of depression Reduced depressed mood		●
Anxiety	Adults	Reduced short-term feelings of anxiety (state anxiety)	●	
	Adults	Reduced long-term feelings and signs of anxiety (trait anxiety) for people with and without anxiety disorders		●
Sleep	Adults	Improved sleep outcomes (increased sleep efficiency, sleep quality, deep sleep; reduced daytime sleepiness, frequency of use of medication to aid sleep)		●
	Adults	Improved sleep outcomes that increase with duration of acute episode	●	

Note: The Advisory Committee rated the evidence of health benefits of physical activity as strong, moderate, limited, or grade not assignable. Only outcomes with strong or moderate evidence of effect are included in this table.

*Crystallized intelligence is the ability to retrieve and use information that has been acquired over time. It is different from fluid intelligence, which is the ability to store and manipulate new information.

Cognition

Compared to inactive people, people who do greater amounts of moderate- or vigorous-intensity physical activity may experience improvements in cognition, including performance on academic achievement tests, and performance on neuropsychological tests, such as those involving mental processing speed, memory, and executive function. Physical activity also lowers the risk of developing cognitive impairment, such as dementia, including Alzheimer's disease. These improvements from physical activity are present for people who have normal as well as impaired cognitive health, including conditions such as attention deficit hyperactivity disorder (ADHD), schizophrenia, multiple sclerosis, Parkinson's disease, and stroke.

Healthy older adults, even in the absence of dementia, often show evidence of cognitive decline, especially on measures of processing speed, memory, and executive function. Physical activity may be an effective approach for improving cognitive function in older adults.

Quality of Life

Physically active adults and older adults are likely to report having a better quality of life. Being physically active also improves the sense of a better quality of life among people who have schizophrenia and related disorders.

Anxiety and Depression

Anxiety and anxiety disorders are the most prevalent mental disorders. Participating in moderate-to-vigorous physical activity over longer durations (weeks or months of regular physical activity) reduces symptoms of anxiety in adults and older adults.

Major depression is one of the most common mental disorders in the United States and is a leading cause of disability for middle-aged adults in the United States. The prevalence of depressive episodes is higher among females, both adolescents and adults, than among males. Engaging in regular physical activity reduces the risk of developing depression in children and adults and can improve many of the symptoms experienced by people with depression.

Sleep

In addition to feeling better, adults who are more physically active sleep better. Greater volumes of moderate-to-vigorous physical activity are associated with reduced sleep latency (taking less time to fall asleep), improved sleep efficiency (higher percentage of time in bed actually sleeping), improved sleep quality, and more deep sleep. Greater volumes of moderate-to-vigorous physical activity are also associated with significantly less daytime sleepiness, better sleep quality, and reduced frequency of use of sleep-aid medications. The improvements in sleep with regular physical activity are also reported by people with insomnia and obstructive sleep apnea.

The evidence that habitual moderate-to-vigorous physical activity reduces the risk of excessive weight gain, an important risk factor for obstructive sleep apnea, suggests that physical activity could have a favorable impact on the incidence of obstructive sleep apnea.

The number of hours before bedtime at which the activity is performed does not matter. Benefits are similar for physical activity performed more than 8 hours before bedtime, 3 to 8 hours before, and less than 3 hours before bedtime.

Cancer

Physically active adults have a significantly lower risk of developing several commonly occurring cancers, as well as lower risk of several other cancers. Research shows that adults who participate in greater amounts of physical activity have reduced risks of developing cancers of the:

- Bladder;
- Breast;
- Colon (proximal and distal);
- Endometrium;
- Esophagus (adenocarcinoma);
- Kidney;
- Lung; and
- Stomach (cardia and non-cardia adenocarcinoma).

These effects appear to apply to both men and women, regardless of weight status. Benefits for cancer survivors are shown in Table 2-4.

People With Chronic Health Conditions and Disabilities

Regular physical activity provides important health benefits for adults with chronic health conditions. As seen in Table 2-4, benefits exist for cancer survivors and people with osteoarthritis, hypertension, type 2 diabetes, dementia, multiple sclerosis, spinal cord injury, and other cognitive disorders.

Table 2-4. Health Benefits Associated With Regular Physical Activity for People With Chronic Health Conditions and Disabilities

Cancer Survivors
▪ Improved health-related quality of life ▪ Improved fitness
Breast Cancer Survivors
▪ Lower risk of dying from breast cancer ▪ Lower risk of all-cause mortality
Colorectal Cancer Survivors
▪ Lower risk of dying from colorectal cancer ▪ Lower risk of all-cause mortality
Prostate Cancer Survivors
▪ Lower risk of dying from prostate cancer
People with Osteoarthritis (knee and hip)
▪ Decreased pain ▪ Improved physical function ▪ Improved health-related quality of life ▪ No effect on disease progression at recommended physical activity levels
People with Hypertension
▪ Lower risk of cardiovascular disease mortality ▪ Reduced cardiovascular disease progression ▪ Lower risk of increased blood pressure over time
People with Type 2 Diabetes
▪ Lower risk of cardiovascular disease mortality ▪ Reduced progression of disease indicators: hemoglobin A1c, blood pressure, body mass index, and lipids
People with Dementia
▪ Improved cognition

People with Multiple Sclerosis
■ Improved physical function, including walking speed and endurance ■ Improved cognition
People with Spinal Cord Injury
■ Improved walking function, muscular strength, and upper extremity function
People with diseases or disorders that impair cognitive function (including ADHD, schizophrenia, Parkinson's disease, and stroke)
■ Improved cognition

Note: The Advisory Committee rated the evidence of health benefits of physical activity as strong, moderate, limited, or grade not assignable. Only outcomes with strong or moderate evidence of effect are included in this table.

Women During Pregnancy and the Postpartum Period

Moderate-intensity physical activity is safe for generally healthy women during pregnancy. Physical activity reduces the risk of excessive weight gain and gestational diabetes during pregnancy. Physical activity increases cardiorespiratory fitness without increasing the risk of negative pregnacy outcomes, such as low birth weight, preterm delivery, or early pregnancy loss. Physical activity during the postpartum period (first year after delivery) also improves the mother's cardiorespiratory fitness, decreases symptoms of postpartum depression, and, when combined with caloric restriction, can help her return to her pre-pregnancy body weight after delivery.

Adverse Events

Some people hesitate to become active or increase their level of physical activity because they fear getting injured or having a heart attack. Studies in generally healthy people clearly show that moderate-intensity physical activity, such as brisk walking, has a low risk of such adverse events.

The risk of musculoskeletal injury increases with the total amount of physical activity. For example, a person who regularly runs 40 miles a week has a higher risk of injury than a person who runs 10 miles each week. Participation in contact or collision sports, such as soccer or football, has a higher risk of injury than non-contact physical activity, such as swimming or walking. However, when performing the same activity, people who are less fit are more likely to be injured than people who are more fit.

Cardiac events, such as a heart attack or sudden death during physical activity, are rare. However, the risk of such cardiac events does increase when a person suddenly becomes much more active than usual. The greatest risk occurs when an adult who is usually inactive engages in vigorous-intensity activity (such as shoveling heavy snow). People who are regularly physically active have the lowest risk of cardiac events both while being active and overall.

The bottom line is that the health benefits of physical activity far outweigh the risks of adverse events for almost everyone.

Risks of Sedentary Behavior

In general, *sedentary behavior* refers to any waking behavior characterized by a low level of energy expenditure (less than or equal to 1.5 METs) while sitting, reclining, or lying. The Guidelines operationalizes the definition of sedentary behavior to include self-reported sitting (leisure-time, occupational, and total), television (TV) viewing or screen time, and low levels of movement measured by devices that assess movement or posture.

More time spent in sedentary behavior increases risk of:

- All-cause mortality;
- Cardiovascular disease mortality;
- Cardiovascular disease;
- Type 2 diabetes; and
- Cancer of the colon, endometrium, and lung.

Learn More

See Appendix 1. Physical Activity Behavior: Intensity, Bouts, and Steps for more information about METs.

Learn More

See Chapter 1. Introducing the Physical Activity Guidelines for Americans for a more detailed discussion of the relationships of sedentary behavior and health.

For inactive adults, replacing sedentary behavior with light-intensity physical activity is likely to produce some health benefits. Among all adults, replacing sedentary behavior with moderate- or vigorous-intensity physical activity may produce even greater benefits.

Chapter 3. Active Children and Adolescents

Childhood and adolescence are critical periods for developing movement skills, learning healthy habits, and establishing a firm foundation for lifelong health and well-being. Regular physical activity in children and adolescents promotes health and fitness. Compared to those who are inactive, physically active youth have higher levels of cardiorespiratory fitness and stronger muscles. They also typically have lower body fat and stronger bones. Physical activity also has brain health benefits for school-aged children, including improved cognition and reduced symptoms of depression. Evidence indicates that both acute bouts and regular moderate-to-vigorous physical activity improve the cognitive functions of memory, executive function, processing speed, attention, and academic performance for these children.

Youth who are regularly active also have a better chance of a healthy adulthood. Children and adolescents do not usually develop chronic diseases, such as heart disease, hypertension, type 2 diabetes, or osteoporosis. However, current evidence shows that obesity and other risk factors for these diseases, such as elevated insulin, blood lipids, and blood pressure, are increasingly appearing in children and adolescents. Exercise training in youth with overweight or obesity can improve body composition by reducing overall levels of body fat as well as abdominal fat. Regular physical activity also makes it less likely that these risk factors will develop and more likely that children remain healthy when they become adults.

This chapter provides physical activity guidance for children and adolescents 3 through 17 years old. The Advisory Committee did not review evidence for children younger than age 3 years.

Preschool-aged children (ages 3 through 5 years) should be encouraged to move and engage in active play as well as in structured activities, such as throwing games and bicycle or tricycle riding. To strengthen bones, young children should do activities that involve hopping, skipping, jumping, and tumbling. Although the specific amount of activity needed to improve bone health and avoid excess fat in young children is not well defined, a reasonable target may be 3 hours per day of activity of all intensities: light, moderate, or vigorous intensity. This is the average amount of activity observed among children of this age and is consistent with guidelines from Canada, the United Kingdom, and the Commonwealth of Australia.

Key Guidelines for Preschool-Aged Children

- ✓ Preschool-aged children (ages 3 through 5 years) should be physically active throughout the day to enhance growth and development.
- ✓ Adult caregivers of preschool-aged children should encourage active play that includes a variety of activity types.

School-aged youth (ages 6 through 17 years) can achieve substantial health benefits by doing moderate- and vigorous-intensity physical activity for periods of time that add up to 60 minutes or more each day. This activity should include aerobic activity as well as age-appropriate muscle- and bone-strengthening activities. It appears that, as in adults, the total amount of physical activity is more important for achieving health benefits than is any one component (frequency, intensity, or duration) or specific mix of activities (aerobic, muscle strengthening, bone strengthening). Even so, bone-strengthening activities remain especially important for children and young adolescents because the greatest gains in bone mass occur during the years just before and during puberty. In addition, the majority of peak bone mass is obtained by the end of adolescence.

Parents and other adults who work with or care for youth should be familiar with the key guidelines in this chapter. Adults play an important role in providing age-appropriate opportunities for physical activity. In doing so, they help lay an important foundation for lifelong, health-promoting physical activity. Adults need to encourage active play in children and encourage sustained and structured activity as children grow older. As children become adolescents, they typically reduce their physical activity, making it all the more important for adults to provide age-appropriate, enjoyable opportunities for physical activity and to encourage youth to participate.

Key Guidelines for School-Aged Children and Adolescents

- ✓ It is important to provide young people opportunities and encouragement to participate in physical activities that are appropriate for their age, that are enjoyable, and that offer variety.
- ✓ Children and adolescents ages 6 through 17 years should do 60 minutes (1 hour) or more of moderate-to-vigorous physical activity daily:
  - **Aerobic:** Most of the 60 minutes or more per day should be either moderate- or vigorous-intensity aerobic physical activity and should include vigorous-intensity physical activity on at least 3 days a week.
  - **Muscle-strengthening:** As part of their 60 minutes or more of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least 3 days a week.
  - **Bone-strengthening:** As part of their 60 minutes or more of daily physical activity, children and adolescents should include bone-strengthening physical activity on at least 3 days a week.

Explaining the Guidelines

Types of Activity

The key guidelines for school-aged children and adolescents focus on three types of activity—aerobic, muscle strengthening, and bone strengthening. Each has important health benefits. Certain activities can be aerobic as well as muscle or bone strengthening. Illustrations of these activities can be found in the real-life examples at the end of this chapter.

Aerobic activities are those in which young people rhythmically move their large muscles for a sustained period of time. Running, hopping, skipping, jumping rope, swimming, dancing, and bicycling are all examples of aerobic activities. Aerobic activities increase cardiorespiratory fitness. Children often do activities in short bursts, which may not technically be aerobic. However, the Guidelines uses the term *aerobic* to refer to these types of activities, even if they are done only briefly.

Muscle-strengthening activities make muscles do more work than usual during activities of daily life. This is called *overload*, and strengthens the muscles. Muscle-strengthening activities can be unstructured and part of play, such as playing on playground equipment, climbing trees, and playing tug-of-war. Or they can be structured, such as lifting weights or working with resistance bands.

Learn More

See Chapter 2. Physical Activity and Health for more on overload and related concepts.

Bone-strengthening activities produce a force on the bones of the body that promotes bone growth and strength. This force is commonly produced by impact with the ground. Running, jumping rope, basketball, tennis, and hopscotch are all examples of bone-strengthening activities. As these examples illustrate, bone-strengthening activities can also be aerobic and muscle strengthening.

How Age Influences Physical Activity in Children and Adolescents

Children and adolescents should meet the key guidelines by doing activity that is appropriate for their age. Their natural patterns of movement differ from those of adults. For example, children are naturally active in an intermittent way, particularly when they do unstructured active play. During recess and in their free play and games, children use basic aerobic and bone-strengthening activities, such as running, hopping, skipping, and jumping, to develop movement patterns and skills. They alternate brief periods of moderate- and vigorous-intensity activity with periods of light-intensity physical activity or rest. Any episode of moderate- or vigorous-intensity physical activity, however brief, counts toward the key guidelines for children and adolescents ages 6 through 17 years. For preschool-aged children, activity of any intensity counts, including light intensity.

Children also commonly increase muscle strength through unstructured activities that involve lifting or moving their body weight or working against resistance. Children do not usually do or need formal muscle-strengthening programs, such as lifting weights. However, these programs are safe for children if they are properly prescribed and supervised.

As children grow into adolescents, their patterns of physical activity change. They are able to play organized games and sports and are able to sustain longer periods of activity. But they still commonly do intermittent activity, and any period of moderate- or vigorous-intensity activity can count toward the key guidelines.

During the transition to adolescence, sex differences in physical activity behavior appear. The amount of physical activity done by girls tends to decrease dramatically compared to that of boys, and the disparity persists into adulthood (Figures 1-1 and 1-2). Therefore, adolescent girls may need additional support and encouragement to maintain health-enhancing physical activity.

Adolescents may meet the key guidelines by doing free play, sports, or structured programs. Structured exercise programs can include muscle-strengthening activities, such as lifting weights, working with resistance bands, or using body weight for resistance (such as push-ups, pull-ups, and planks). Muscle-strengthening activities count if they involve a moderate or greater level of effort and work the major muscle groups of the body—legs, hips, back, abdomen, chest, shoulders, and arms.

Levels of Intensity for Aerobic Activity

Children and adolescents ages 6 and older can meet the key guidelines by doing a combination of moderate- and vigorous-intensity aerobic physical activities or by doing only vigorous-intensity aerobic physical activities. Youth should not do only moderate-intensity activity. It is important to include vigorous-intensity activities because they lead to greater improvement in cardiorespiratory fitness.

The intensity of aerobic physical activity can be defined on either an absolute or a relative scale. Either scale can be used to monitor the intensity of aerobic physical activity:

Absolute intensity is the amount of energy expended during the activity, without considering a person's cardiorespiratory fitness.

Relative intensity uses a person's level of cardiorespiratory fitness to assess level of effort.

Relative intensity describes a person's level of effort relative to his or her fitness. As a rule of thumb, on a scale of 0 to 10, where sitting is 0 and the highest level of effort possible is 10, moderate-intensity activity is a 5 or 6. Young people doing moderate-intensity activity will notice that their hearts are beating faster than normal and they are breathing harder than normal. Vigorous-intensity activity begins at a level of 7 or 8. Youth doing vigorous-intensity activity will feel their heart beating much faster than normal, and they will breathe much harder than normal.

Learn More

See Appendix 1. Physical Activity Behavior: Intensity, Bouts, and Steps for *a more detailed discussion of intensity and how to measure it.*

When adults supervise children, they generally cannot ascertain a child's heart or breathing rate. However, they can observe whether a child is doing an activity which, based upon absolute energy expenditure, is considered to be either moderate or vigorous intensity. For example, a child walking to school is doing

moderate-intensity activity. A child running on the playground is doing vigorous-intensity activity. However, children with low fitness may experience activities that are moderate intensity on the absolute scale as being vigorous intensity. Table 3-1 includes examples of activities classified by absolute intensity. It shows that some activities, such as bicycling, can be moderate or vigorous intensity, depending upon level of effort.

Table 3-1. Examples of Aerobic, Muscle-, and Bone-Strengthening Physical Activities for Children and Adolescents

Type of Physical Activity	Preschool-Aged Children	School-Aged Children	Adolescents
Moderate–intensity aerobic	■ Games such as tag or follow the leader ■ Playing on a playground ■ Tricycle or bicycle riding ■ Walking, running, skipping, jumping, dancing ■ Swimming ■ Playing games that require catching, throwing, and kicking ■ Gymnastics or tumbling	■ Brisk walking ■ Bicycle riding ■ Active recreation, such as hiking, riding a scooter without a motor, swimming ■ Playing games that require catching and throwing, such as baseball and softball	■ Brisk walking ■ Bicycle riding ■ Active recreation, such as kayaking, hiking, swimming ■ Playing games that require catching and throwing, such as baseball and softball ■ House and yard work, such as sweeping or pushing a lawn mower ■ Some video games that include continuous movement
Vigorous–intensity aerobic	■ Games such as tag or follow the leader ■ Playing on a playground ■ Tricycle or bicycle riding ■ Walking, running, skipping, jumping, dancing ■ Swimming ■ Playing games that require catching, throwing, and kicking ■ Gymnastics or tumbling	■ Running ■ Bicycle riding ■ Active games involving running and chasing, such as tag or flag football ■ Jumping rope ■ Cross-country skiing ■ Sports such as soccer, basketball, swimming, tennis ■ Martial arts ■ Vigorous dancing	■ Running ■ Bicycle riding ■ Active games involving running and chasing, such as flag football ■ Jumping rope ■ Cross-country skiing ■ Sports such as soccer, basketball, swimming, tennis ■ Martial arts ■ Vigorous dancing

Type of Physical Activity	Preschool-Aged Children	School-Aged Children	Adolescents
Muscle strengthening	■ Games such as tug of war ■ Climbing on playground equipment ■ Gymnastics	■ Games such as tug of war ■ Resistance exercises using body weight or resistance bands ■ Rope or tree climbing ■ Climbing on playground equipment ■ Some forms of yoga	■ Games such as tug of war ■ Resistance exercises using body weight, resistance bands, weight machines, hand-held weights ■ Some forms of yoga
Bone strengthening	■ Hopping, skipping, jumping ■ Jumping rope ■ Running ■ Gymnastics	■ Hopping, skipping, jumping ■ Jumping rope ■ Running ■ Sports that involve jumping or rapid change in direction	■ Jumping rope ■ Running ■ Sports that involve jumping or rapid change in direction

Note: Some activities, such as bicycling or swimming, can be moderate or vigorous intensity, depending upon level of effort. For preschool-aged children, aerobic activities listed can be either moderate or vigorous intensity.

Meeting the Key Guidelines

American youth vary in their physical activity participation. Some do not participate at all, others participate in enough activity to meet the key guidelines, and some exceed the key guidelines.

One practical strategy to promote activity in youth is to replace sedentary behavior with activity whenever possible. For example, where appropriate and safe, young people should walk or bicycle to school or the bus stop instead of riding in a car. Rather than only watching sporting events on television, young people should participate in age-appropriate sports or games.

- **Children and adolescents who do not meet the key guidelines** should slowly increase their moderate-to-vigorous physical activity in small steps and in ways that they enjoy. A gradual increase in the number of days and the time spent being active will help reduce the risk of injury.
- **Children and adolescents who meet the key guidelines** should continue doing moderate-to-vigorous physical activity every day and, if appropriate, become even more active. Evidence suggests that even more than 60 minutes of activity daily may provide additional health benefits for school-aged youth.
- **Children and adolescents who exceed the key guidelines** should maintain their activity level and vary the kinds of activities they do to reduce the risk of overtraining or injury.

Special Considerations

Children and Adolescents With Disabilities

Children and adolescents with disabilities are more likely to be inactive than those without disabilities. Youth with disabilities should work with a health care professional or physical activity specialist to understand the types and amounts of physical activity appropriate for them. When possible, children and adolescents with disabilities should meet the key guidelines. When young people are not able to participate in the appropriate types or amounts of physical activities needed to meet the key guidelines, they should be as active as possible and avoid being inactive.

Getting and Staying Active: Real-Life Examples

Children and adolescents can meet the key guidelines and become regularly physically active in many ways. The first example is for a preschool-aged child showing how light-, moderate-, and vigorous-intensity physical activity can be incorporated throughout the day. The next examples are for a child and for an adolescent who are meeting the 60 minutes-a-day key guideline.

Jake: A 4-Year-Old Child

At childcare, Jake goes outside twice a day and plays games like hide-and-seek or hopscotch, chases his friends, and enjoys climbing up and going down the slide. At home, Jake is always on the move, whether he is building a fort in the living room, running around with his older sister, or seeing how high he can jump. On the weekends, Jake takes swimming lessons at the community pool or does gymnastics at the local recreation center. His family also likes to go to the city park, where Jake enjoys riding his tricycle. At home, Jake's parents limit his screen time. All these activities ensure that Jake does at least 3 hours of movement a day.

Ebony: An 11-Year-Old Child

Ebony has a physical disability and uses a wheelchair to get around. Ebony does 60 or more minutes of daily physical activity that is at least moderate intensity, and she also includes vigorous-intensity, bone-strengthening, and muscle-strengthening activities. Here are the daily activities she participates in during a sample week:

- **Monday and Friday:** Wheels to and from school (20 minutes); races a friend during recess (10 minutes); plays basketball during an afterschool program (30 minutes)
- **Tuesday and Thursday:** Wheels to and from school (20 minutes); actively participates during physical education class (50 minutes); plays four square in her afterschool program (15 minutes)

- **Wednesday:** Wheels to and from school (20 minutes); plays tag during recess (20 minutes); participates in an adaptive swim program (45 minutes)
- **Saturday:** Participates in an adaptive swim program (45 minutes); wheels with her mom to and from the grocery store (25 minutes)
- **Sunday:** Goes on a family bike ride using her adaptive bike (60 minutes); plays catch with her sister (10 minutes)

Ebony is working toward meeting the key guidelines by doing vigorous-intensity aerobic activities, bone-strengthening, and muscle-strengthening activities several days a week:

- **Vigorous-intensity** activities on 5 days: basketball, tag or racing at recess, bicycling, and swimming
- **Bone-strengthening** activities on 2 days: physical education class
- **Muscle-strengthening** activities on 2 days: physical education class

Darius: A 16-Year-Old Adolescent

Darius does 60 or more minutes of daily physical activity that is at least moderate intensity. Here are the daily activities he participates in during a sample week when school is not in session:

- **Monday and Wednesday:** Walks dog (10 minutes); plays basketball at a nearby school gym that has a shared-use agreement for community physical activity during the summer (50 minutes)
- **Tuesday and Thursday:** Walks dog (10 minutes); plays doubles tennis (30 minutes); does planks and push-ups (5 minutes) with his dad in the evening; rides his bicycle to a friend's home (15 minutes)
- **Friday:** Plays Frisbee in the park with friends (60 minutes)
- **Saturday:** Vacuums his family's home and cleans the bathrooms (30 minutes); rides his bike on a local trail (30 minutes)
- **Sunday:** Plays an active video game with his family that involves continuous movement at a moderate intensity (30 minutes); does body-weight exercises in his room (30 minutes)

Darius meets the key guidelines by doing vigorous-intensity aerobic activities, bone-strengthening, and muscle-strengthening activities on at least 3 days a week:

- **Vigorous-intensity** activities on 4 days: basketball and bicycling
- **Bone-strengthening** activities on 4 days: basketball, tennis
- **Muscle-strengthening** activities on 3 days: body-weight exercises, including planks and push-ups

Texas 4-H Youth Development
Healthy Lifestyles Invitational

Electronic (E-cig) Study Resources

The use of electronic cigarettes continues to rise, but are they safe? Do you know the facts? The web pages below are the official Healthy Lifestyle Invitational contest study resources. Classes will be developed based on information from these pages.

Electronic Cigarettes and Young People
https://www.cdc.gov/tobacco/basic_information/e-cigarettes/Quick-Facts-on-the-Risks-of-E-cigarettes-for-Kids-Teens-and-Young-Adults.html

About Electronic Cigarettes
https://www.cdc.gov/tobacco/basic_information/e-cigarettes/about-e-cigarettes.html

E-Cigarettes and Vape Pens: Units 1 – 6
https://med.stanford.edu/tobaccopreventiontoolkit/E-Cigs.html

SUNGLASSES

Sunglasses can be a very important fashion accessory. But their most important function is safeguarding the health of our eyes by preventing damage from the sun's ultraviolet (UV) rays. Most people, including children, should own a pair of shades, and in some cases, may need more than a single pair.

The National Eye Institute reports that an estimated 20% of cataracts cases are caused by extended UV exposure. In addition, UV exposure can cause macular degeneration which is the leading cause of blindness in the United States. In 1988, a study by Johns Hopkins University indicated that people who did not use some form of eye protection were three times more likely to suffer from eye ailments such as cancer of the eyelids than those who wore protective sunglasses. Most sunglasses will protect eyes adequately, although some styles do not include protective features. Nothing, including sunglasses, offers protection against the harm caused by looking directly into the sun. That includes before, during, and after an eclipse as witnessed in the United States in August 2017.

Choosing sunglasses for eye protection allows a wide range of choices. Selecting a pair of sunglasses based on wearer comfort and personal preference may be more difficult. Knowing what features are available will help in finding the best pair of sunglasses for the conditions in which they will be worn.

FUNCTION

Besides the infinite variety of fashion design and style, sunglasses offer a more valuable and practical purpose. Sunglasses can offer both protection and comfort for the eyes.

Eyes are bombarded with light rays of all wavelengths from the sun as well as from artificial light. However, much of the concern over eye health involves the shorter wavelengths, called ultraviolet (UV) light. UV light is further divided into two categories of shorter wavelengths (UVB) and longer wavelengths (UVA). Research has shown that UVB rays (the shorter of the two) have been found to cause more eye damage than UVA rays.

The main protection offered by sunglasses is filtering out these UV rays. How dark the lenses are does not determine how well UV light is filtered out. Blocking UV rays is often accomplished by adding chemicals to the lenses or adding a special coating. In fact, a clear lens with no tint and 100% UV protection is better for your eyes than dark, heavily tinted sunglasses without UV protection.

Sunglasses can provide other benefits than UV protection. Working or playing in bright light can cause the eyes to tire quickly or become fatigued. Wearing sunglasses while working in bright sunlight or brightly lit work areas can provide comfort and keep eyes from tiring quickly.

Sunglasses also provide some protection from dust, debris, and particles in the air. Sunglasses may serve to keep dirt from getting into the wearer's eyes and becoming uncomfortable. This is especially true for people who wear contact lenses.

LABELING

Labels should reference that the sunglasses "block 99 to 100 percent of UVA and UVB rays" or "absorbs up to 400 nm of UV radiation."

ANSI – The American National Standards Institute is a nonprofit organization that oversees development of voluntary standards for sunglasses and other products. More specifically, the reference to "ANSI Z80.3" is related to the blocking of UV rays, including UVA and UVB and the normal to strictest UV blocking requirements.

ISO – The International Standards Organization is an independent, non-governmental international organization that develops specifications for products, services and systems, to ensure quality, safety, and efficiency in almost all aspects of technology and manufacturing. Sunglasses may refer to or include labeling that includes ISO 8980-3 which relates to the "attenuation" of solar radiation (UV light). They may also be labeled with ISO 14889 as "…intended for driving."

Examples of ANSI and ISO labeling requirements related to intended use and performance claims may include absorbing, reflective, tinted, polarizing, or photosensitizing lenses to attenuate light and reduce glare.

Federal labeling requirements (U.S. Food & Drug Administration) are completely voluntary but do allow for labels that claim the sunglasses may "…reduce eye strain and/or eye fatigue due to glare."

Some recommended standards:

- Block 99% of UVB light. A UVB-blocking sunglass is adequate to protect eyes in moderately bright sunlight such as that found in low-altitude, urban areas
- A UV-blocking sunglass blocks 99% of both UVA and UVB. A UV-blocking sunglass is adequate protection in very bright sunlight like that found in low-altitude snow areas and beaches. Such sunglasses should block 60-90% of visible light to adequately reduce glare and increase visual comfort. The lenses should allow you to recognize traffic signals accurately.
- To protect eyes during prolonged daily use in extremely bright sunlight, like high-elevation snow areas and equatorial sand beaches, a UV-blocking sunglass should block 92-97% of visible light and have side shields. Goggles are also acceptable. Side shields are needed in extremely bright sunlight to prevent UV rays and light from being reflected into the eyes. These sunglasses limit a driver's ability to accurately recognize traffic signals. Side shields should not be worn when driving because they eliminate peripheral vision.
- The only medical claims allowed on sunglasses are that they prevent cataracts and photo keratitis.

FRAMES

Frame materials are generally made of plastic, nylon, metal, or metal alloy. Frames should be considered for form and function. They should also be comfortable and sturdy. You should always check your frames to ensure they have not been bent or warped out of shape during storage or transport. The frame's primary function is to hold the lenses. They should not interfere with or block the wearers vision, including peripheral. Labeling of the frame material may be a bit absent for the lower-end frames.

- Plastic frames are generally the most affordable option
- Acetate frames are a form of plastic are a bit stronger, more flexible, and lighter than standard plastic frames. They come in a huge variety of colors and textures. The color tends to stay because it is embedded in the material not painted on like other plastics.
- Polycarbonate frames are very versatile, tough plastic with impact resistance and is used in many sports. Despite their toughness, they tend to be rigid frames and are not very flexible. These are good frames for children because they can really take a lot of abuse.
- Nylon frames are very resistant to temperature fluctuations, remain very flexible, but are stiff enough for safety. These frames tend to be less expensive, lightweight, and stronger than metal frames.
- Metal frames are commonly used dur to its malleability, corrosion resistance, and east of adjustability making it very easy to tailor to many face shapes. They tend to be more expensive, less durable, and not ideal for sports. Titanium frames are more durable but tend to be more expensive.

Frame size can vary greatly between manufacturers and styles. There are several measurements that are standard on eyewear, but not all sunglasses indicate the size of the frames. The frame size may be represented by three numbers (e.g. 52 – 18 140 MM or 52 - 18 140) located on the inside of the temple or bridge of the frames. The first number is lens width (52), then bridge width (18), and the temple length (140) in millimeters. Many sunglasses are marketed on a Small, Medium, or Large scale. Knowing the dimensions of your face temple-to-temple may be useful in this regard. The frames should be wide enough to not press on the temples. However, this makes is much more difficult to select a pair of sunglasses without trying them on, making internet purchases a challenge. Another size factor is the temple length. The temples should be long enough to rest comfortably over the ears. Proper fit for comfort and function are important.
Frame function refers to the style and purpose of the sunglasses. This is the broadest of variables in selecting your sunglasses. The wearer should consider the primary use of the eyewear to determine the best frame style. The frame style may also impact the type and size of lens it will accommodate. Some frame styles are not suited for glass lenses. One distinct style is the wraparound sunglasses. They are shaped to keep light from shining around the frames and into your eyes. Studies have shown that enough UV rays enter around ordinary eyeglass frames to reduce the benefits of

protective lenses.

Large-framed wraparound sunglasses can protect your eyes from all angles. Keep in mind that frames should not obstruct your vision, or side vision. However, the main criteria for frame style is wearer preference.

Frame color is entirely at the discretion of the wearer. As long as a style is comfortable, functional, and does not block vision, then color has no real bearing aside from wearer preference.

LENSES

The materials used to make sunglass lenses varies between glass, plastic and SR-91. In fact, there are many types of glass and plastic used as lenses in sunglasses. The most common materials are identified here. Finding a pair of sunglasses that are made of unique materials may make your decision a little more difficult. Consider doing your own research on variations of these more common materials.

Glass lenses have the best optical clarity and provide a greater resistance to scratching than other materials. However, they are much heavier relative to the plastic or SR-91 lenses. Another advantage of glass lenses is they are better at retaining their shape in extreme temperatures. Specifically, leaving glass-lens sunglasses on the dash of your car in direct sunlight on a sweltering day will likely not warp or change their shape unlike plastic lenses. From a technical perspective, glass lenses tend to be thinner than plastic lenses due to their refractive index range. This is important when you are purchasing prescription sunglasses. Vision that requires greater correction requires more curvature of the lenses which results in thicker lenses. Relative to plastic lenses, glass lenses will likely be thinner due to their better refractive index range. Nonetheless, the glass lens will most likely be heavier than its plastic counterpart. One very important disadvantage of glass lenses is that they can shatter or break on impact. This is important to keep in mind depending on the application and use. As a general rule of thumb, you can expect to pay more for glass lenses than plastic lenses.

SR-91 lenses are made from a proprietary resin-based material developed by Kaenon Polarized and are exclusive to their brand of eyewear. They are considered a luxury performance brand that has the highest rating of optical clarity and acuity. In addition, SR-91 lenses pass the high-mass impact ANSI
1.1.1 testing. The SR-91 material is very light, much like plastic lenses, and are good for sporting and long wear applications. One can expect to pay more for these types of lenses than any other type of lens material including glass or plastic.

Plastic lenses can be made from several types of plastic such as acrylic, polycarbonate, plastic polymer (CR-39), or polyurethane. In general, plastic lenses are lighter and provide greater shatter-resistance than glass lenses. However, they are more susceptible to scratches. Polycarbonate plastic lenses are the lightest of the plastics and are virtually shatterproof. This makes them exceptional choices for impact protection. The most common plastic used for eyewear lenses is CR-39. This material is light, has higher scratch resistance than other plastics, and low transparency for ultraviolet and infrared radiation.

Note: Infrared wavelengths are invisible and produce heat. Sunlight has low levels of infrared rays, and the eye tolerates infrared well. Some sunglass manufacturers make health claims for their products based on infrared protection, but research has not shown a close connection between eye disease and infrared rays.

Photochromic lenses can be made of glass or plastic. Also referred to as photosensitive lenses, they darken and lighten in response to the amount of available light or type of light. For sunglasses, this may be a valuable tool for situations where the amount of light varies. This would allow a lens to get darker in brighter light. The more direct sunlight they are exposed to affects how dark the lens will become. It is important for drivers to know that these lenses will not be as dark inside the vehicle because they are not exposed to as much UV light. This may cause eye fatigue on very bright days when glasses do not darken fully. Another important characteristic is that they darken more quickly than they lighten. This may create problems when moving from direct to indirect sunlight areas. While sunglasses by nature do have a specific lightness/darkness, this lens adds variability to a pair of sunglasses. This can be a very useful option for some wearers, but not very commonly found on the market making it difficult to find.

COATINGS AND TINTS

Coatings and tints are added features that are added to lens in the manufacturing process or as part of custom lens retailers. Either way, there is a wide range of options that provide some value and style to the wearer in the appropriate situation.

Polarized lenses are specifically designed to reduce glare which is generally caused by reflected sunlight or artificial Light. Some of the most common sources of glare from bright sunlight could include light bouncing off water, pavement, glass, or other reflective surfaces. Polarized lenses also improve contrast because of the reduced glare. People involved in water sports and fishing have been taking advantage of the benefits from polarized lenses for many years. However, more and more outdoor enthusiasts have found benefit from the glare-reducing feature. Polarization is a coating or film that is added to a lens. This coating can be as part of the manufacturing process for sunglasses or can be added when ordering custom sunglasses as an added feature. Adding this coating at the time of purchase is only likely to occur among custom sunglass or optical retailers with the ability to customize lenses at the buyer's request. Your standard retailers will likely market sunglasses with a variety of styles and options with and without polarization since they do not have the ability to customize your pair of sunglasses.

Tinting is also a coating that is added to lenses. Tinting can have both aesthetic benefits or functional benefits to the wearer. If you are looking for style, there are several ways to tint lenses to make the special impression and just look great. As with other features of sunglasses, they can be purchased with as is or can be customized with specialty retailers that offer customization.

- Plain lenses are uniformly tinted throughout the lens and come in a wide range of tints or colors. The darkness of the lens has nothing to do with how well it blocks UV light, but it will make a difference in how much visible light gets seen. This may be important for eye comfort during prolonged time in bright sunlight.
- Single gradient lenses are tinted darker at the top and lighter at the bottom. They may be useful for tasks like driving, where the road is bright but the dashboard is dark. They are not very useful for places like the beach where light is reflected up from the sand. They may also be useful when walking to avoid tripping, especially when going from a bright area (outside) to a darker area (inside). The difference in tint also causes the lighting to change as the wearer moves their head which may be annoying for some. Gradients can add a unique look or style to the wearer.
- Double gradient lenses are tinted darker at the top and bottom, but lighter in the center. These are very specifically designed for sports such as sailing, skiing, and tennis, where light comes in from above and below, but the center of vision has less light coming in. These glasses are not appropriate for driving, since they darken visibility of the dashboard controls. Like the single gradients, the changing of light with head movement may be annoying to the wearer.

Anti-Reflective (AR) coating is a thin coating that eliminates or greatly reduces reflections and glare that are created by the light reflected by lenses themselves. This can occur on the front or back of the lens. However, in the case of sunglasses, the more common use of AR coating is on the back (inside) of the lens. This coating eliminates glare on the inside of the lens that may occur from light coming in from the sides, top, or bottom of the frames. AR coating works better with plastic lenses but also makes them more susceptible to scratching. Combining AR coating with scratch coating may reduce this issue but adds cost to the lenses.

Anti-Scratch coating is a film or coating that can be applied to sunglass lenses that reduces the appearance of scratches on the lens. Anti-Scratch coating does not make lenses scratchproof, it only reduces the likelihood. Scratches can impair vision depending on the location and severity of the scratch. This coating can prolong the life of your sunglasses. They are generally not an expensive option to add to your custom glasses.

Mirror or Flash lenses have a mirrored or flash coating that is reflective on the outside (front) of the lens with metallic silver, iridescent, or colored appearance. The coating makes them appear like mirrors and typically give the wearer's vision a brown or grey tint. The mirror coating decreases the amount of light passing through the tinted lens making them useful at high altitudes or in sand, water, or snow. One significant disadvantage is that they can scratch easily.

LENS COLOR

Lens color can be a dye in the lens or a coating on the lens. Color on coated lenses is more likely than dyed lenses to scratch or wear off. Coated lenses can be protected by the manufacturer through use of scratch-resistant layers. Overall, dyed lenses retain color longer.

Darkness of a lens determines how much visible light will be let in. No special instruments are needed for this—the wearer can tell just by looking through the lenses. If glasses are to be worn in very bright conditions such as for water sports, a darker lens is more practical. For everyday wear, a medium to light lens is usually sufficient and may be more versatile. The main point is to match the amount of tint to the purpose for which the glasses will be used.

At one time, amber lenses were claimed to be superior because they reduced "blue light," or shorter light rays. Because amber colored glasses reduce the transmission of blue light, they are sometimes preferred by pilots or others who need enhanced clarity of distant objects which may be obscured by a blue haze. However, no studies have proven that amber glasses provide any more protection as it relates to eye health than other colors. The amber sunglasses are popular among skiers, hunters, boaters and pilots

Lens color makes little to no difference in effectiveness of eye health. The color preference of the wearer is the main basis for color choice. Gray colored lenses offer the least color distortion to the wearer. Because of this, they are preferred by some people.

Care should always be taken when selecting colored lenses when it comes to driving. Some colored lenses affect the way traffic signals appear to the wearer. Certain colors may affect not only the recognition of specific traffic signal colors but the transition of those signals.

QUALITY

Most sunglass lenses are made of plastic which are more durable than glass lenses. Plastic lenses are lighter than glass lenses, reducing the overall weight of the glasses. Plastic lenses scratch more easily than glass lenses, but can be coated with an anti-scratch layer. One way to evaluate lens quality is to look for scratches on the lenses at the store. Many times, unpackages sunglasses on displays are handled by many people which can cause scratches. However, this might be a good indicator of quality if a certain style or brand have scratches on the lenses. If they are packaged and have scratches on the lenses, that could also be an indicator of inferior quality. Glasses that cannot survive transport without scratching will scratch easily in everyday wear.

Lens distortion occurs in both glass and plastic lenses. It means that looking at objects through the lenses causes the objects to look oddly shaped. In glass lenses, this may occur if the glass has been formed rather than ground. In plastic lenses, distortion may occur because of handling after manufacture. Either way, distortion is easy to detect. Find an object with straight lines (like floor tile) and look through the lenses at arm's length, and moving the lenses slightly up/down and left/right. If the lines warp or curve when you move the glasses, the lens is distorted. Cost is not a guarantee of distortion-free lenses or quality. Inexpensive lenses will often be free of distortion. All sunglass lenses must pass the Food & Drug Administration's safety test for breakage.

COST

Where sunglasses are concerned, there is no direct correlation between price and performance. Effective, reliable, high quality sunglasses can be found among even the most inexpensive options.

The lowest priced sunglasses may be more prone to lens distortion or scratching, but both of these conditions cans be determined by visual inspection and reading labels for protective coatings, construction materials, and ratings. High fashion and brand names may raise the price, and many times provide better labeling and information than lower priced options.

ACCESSORIES

As with most consumer products, a variety of accessories is available to go with sunglasses.

Retainers, cords, cases, pouches, visor clips, spare lenses, cleaning kits and more are all available for sale individually or come with eyewear purchases. There are infinite styles, sizes, colors, shapes, and materials of these accessories. Some of them add to the functionality of your sunglasses, while others prolong their life. Consider how the accessories add or detract from the value of your purchase.