

CHAPTER  
3

The Positive Effects  
of Exercise Across  
the Lifespan

Steve Peterson

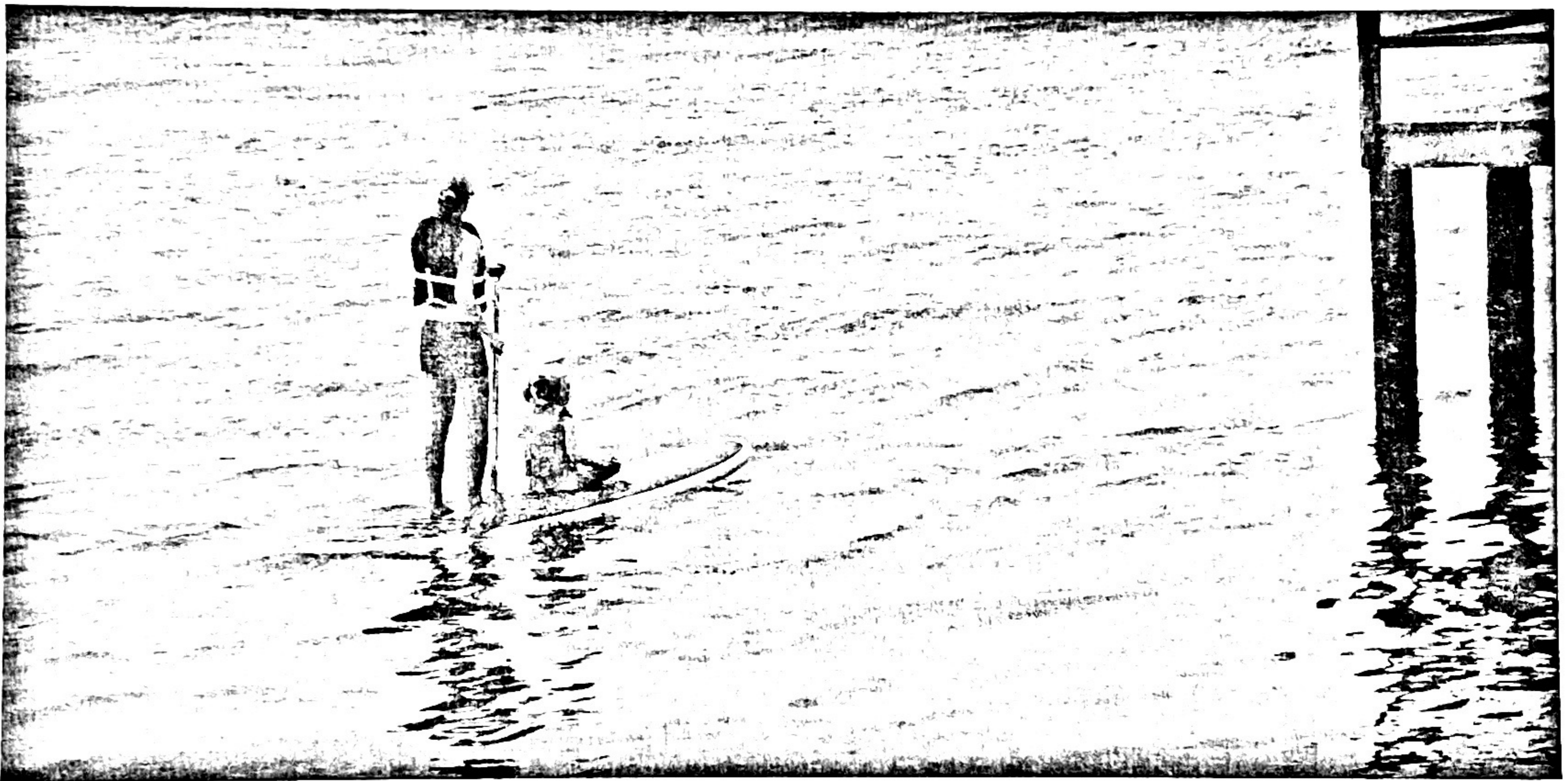


Photo courtesy of Maria Napoli

*The ocean bathes my senses  
It challenges my muscles  
Stretching, moving, flexing  
We sail together in bliss*

Maria Napoli

*"If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health."*

—Hippocrates<sup>1</sup>

YanLev/Shutterstock.com



Karramba Production/Shutterstock.com



MJTH/Shutterstock.com



There is no shortage of public exposure to, or availability of, medical, social-behavioral, and psychological information related to the health and wellness benefits of exercise, nor is it difficult to find a book or televised program exhaustive of information related to diet and exercise. Barnes & Noble<sup>2</sup> offers over 60,000 titles in media and print within the "diet and exercise" category and The Book Depository<sup>3</sup> offers over 15,000 titles under "exercise and workout books." On any particular Sunday morning there are 13 available segments on cable television offering various workout regimens, diet and exercise guidance or products to promote exercise at home.

In 2012, the American Physiological Society published a study that demonstrates that physical inactivity contributes to most of 35 major chronic health conditions, that sedentary behavior increases risks of deteriorating health across the lifespan, that childhood/adolescent activity carries clinical consequences into adulthood, and that physical activity can prevent or delay the onset of chronic diseases.<sup>4</sup>

Yet in that same year, the Centers for Disease Control and Prevention released a report stating that less than 50% of adults met the 2008 Physical Activity Guidelines for aerobic activity and less than 25% met the guidelines for muscle-strengthening activity. Also, only one-third of high school students receive 60 minutes of physical activity every day.<sup>5</sup> This same report identified an alarming behavior of adolescents/adults: nearly 25% reported that they did not participate in ANY physical activity (representative of exercise) in the past month.

## Physical Activity Guidelines for Americans<sup>6</sup>

### **Guidelines for Children and Adolescents<sup>6</sup> (Ages 6 to 17)**

- Overall recommended: 60 minutes or more of physical activity daily.
- Aerobic: Most of the 60 or more minutes a day should be either moderate or vigorous-intensity aerobic physical activity, and should include vigorous-intensity physical activity at least 3 days a week.

- **Muscle-strengthening:** As part of the 60 or more minutes of daily physical activity, muscle-strengthening physical activity should be included on at least 3 days of the week.
- **Bone-strengthening:** As part of the 60 or more minutes of daily physical activity, bone-strengthening physical activity should be included on at least 3 days of the week.

## Guidelines for Adults<sup>6</sup> (Ages 18 to 64)

- All adults should avoid inactivity. Some physical activity is better than none, and adults who participate in any amount of physical activity gain some health benefits.
- For substantial health benefits, adults should do at least 150 minutes a week of moderate-intensity, or 75 minutes a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Aerobic activity should be performed in episodes of at least 10 minutes, and preferably, should be spread throughout the week.
- For additional and more extensive health benefits, adults should increase their aerobic physical activity to 300 minutes a week of moderate intensity, or 150 minutes a week of vigorous intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity activity. Additional health benefits are gained by engaging in physical activity beyond this amount.
- Adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.



gpointstudio/Shutterstock.com

## Guidelines for Older Adults<sup>6</sup> (Ages 65 and older)

- The Guidelines for Adults also apply to older adults. Additionally, these guidelines apply specifically to older adults:
  - ◆ 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.
  - ◆ Older adults should do exercises that maintain or improve balance if they are at risk of falling.
  - ◆ 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.



auremar/Shutterstock.com

# What Qualifies as Exercise?

Kapreski/Shutterstock.com



Many may find the idea of exercise a bit challenging or unattainable either because of an inaccurate definition of what qualifies as exercise or by assuming that exercise must be inclusive of a gym membership and structured activities that have a cost involved.

Exercise is a physical activity that is planned, structured and repetitive for the purpose of conditioning a part of the body, comprised of a series of movements done to become stronger and healthier.<sup>7</sup>

As mentioned previously, it is recommended that individuals in all age groups should participate in some component of active (muscle- and bone-strengthening) exercise as well as aerobic exercise.

Active exercise is motion imparted to a part of the body by voluntary contraction and relaxation of its controlling muscles.<sup>8</sup>

Aerobic exercise is designed to increase oxygen consumption and improve functioning of the cardiovascular and respiratory systems.<sup>8</sup>

To determine if an activity “qualifies” as exercise, anyone of any age can identify a pleasurable exercise/recreational activity that can be *their* exercise as long as it falls within the parameters for active and aerobic activity. These activities can range from the zealous running around and climbing on playground equipment that children participate in, intramural high school activities and hiking with friends for the adolescent, treadmills, or regular yard work for the adult, or working in a garden and walking around the neighborhood for the senior citizen. There are no scripted activity constraints as long as the activity combats a sedentary lifestyle. If someone finds the activity pleasurable and rewarding, they will be more likely to repeat the exercise and commit to a regular regimen.

## Indoor Versus Outdoor Exercises?

Viktoria Gavrilina/Shutterstock.com



Rocksweeper/Shutterstock.com



There are many variables that affect an individual’s indoor versus outdoor exercise choices: personal preference, climate or weather constraints, and the specificity of the activity itself (indoor sport versus individual outdoor activity). Studies suggest that there are mutual benefits to either venue.

Outdoor exercise activities may provide a greater degree of stress relief and energy levels than indoor activities.<sup>9</sup> The connectivity with nature, the exposure to fresh air, and the mental release can provide a more enriching and motivating experience. Some activities just lend themselves to being outdoors. Jogging on a sunny day, water recreation, gardening, etc. have a built-in “nature” component that encourages deeper breathing, mindful awareness of environmental stimuli, and overall distraction from urbanization. Merely being outside for many promotes physical activity. A study of children found that physically activity increased when an activity was held outdoors instead of indoors<sup>10</sup> and older adults tend to exercise for longer period outdoors than indoors.<sup>11</sup>

However, indoor exercise (gym memberships, yoga classes, etc.) tend to promote motivation to work out because of the social setting.<sup>12</sup> An active career and family lifestyle may lend itself to a gym membership or other social indoor activities for the average adult. Many gyms are open 24 hours a day and offer various exercise classes during the lunchtime hours and immediately after work to accommodate the busy adult lifestyle.

Essentially it is the exercise itself that is of greatest importance and benefit, not necessarily the environment within which it is conducted.

## ACTIVITY: IDENTIFY YOUR PHYSICAL ACTIVITY

*“Take care of your body. It’s the only place you have to live.”*

—Jim Rohn<sup>13</sup>

Answer the following questions by checking/completing the appropriate boxes:

1. On which days did you get at least thirty minutes of exercise last week?

Mon  Tues  Weds  Thur  Fri  Sat  Sun

2. How many minutes in each of those days was aerobic exercise?

Mon	Tues	Weds	Thur	Fri	Sat	Sun

3. How many minutes in each of those days was a muscle-strengthening exercise?

Mon	Tues	Weds	Thur	Fri	Sat	Sun

4. If you need to improve your level of weekly exercise, what are you willing to do?

## Childhood as the Foundational Period of Physical Development and Emotional Well-Being

Photo courtesy of Maria Napoli



Physical growth, specifically tissue growth (predominately muscle), occurs at a steady pace between the ages of 2 and 10 in preparation for a final growth spurt during adolescence.<sup>14</sup> Boys grow about 4 inches during their adolescent period and girls approximately 3½ inches.<sup>15</sup>

ayelet-keshet/Shutterstock.com



Proper nutrition and exercise are vital during this period as it is a precursor for final adolescent physical growth and muscular-skeletal development. Exercise reduces body-fat concentration. This is important because studies have shown that elevated levels of saturated fats and adipose tissue prevent muscle enlargement and development; specifically increased levels of inflammation occur (cortisol release), insulin levels are altered, and fibrosis occurs.<sup>16</sup> These events contribute to atrophy and inhibited muscle development. A Centers for Disease Control and Prevention report in 2014 identified that in the United States 8.4% of 2- to 5-year olds were considered obese, as well as 17.7% of 6- to 11-year olds.<sup>17</sup> Obesity is defined as having excess body fat, a result of caloric imbalance from too few calories expended compared to the amount of calories consumed.<sup>18</sup>

alexmillos/Shutterstock.com



Weight control, improved strength and endurance, improved cholesterol and blood pressure levels as well as improved muscle and bone growth are all clinical results of regular childhood physical activity.<sup>19</sup> Also, it is suggested that this regular physical activity can reduce the risks of childhood diabetes and later onset of cardiovascular disease.

In addition to physiological benefits, it has been demonstrated that schoolchildren who are physically active tend to perform better academically.<sup>20</sup> This can be related to improved cognitive ability and stability, but also a healthy level of self-esteem.

The health and wellness of a child's self-esteem can be contributed to many factors. However, taking into consideration the degree that a child's social development is impacted by school and its related childhood interactions, it is important to lend credence to the impact that exposure has to a child's self-esteem

and self-image. School-age bullying has gained national attention as a very real and destructive presence in our school systems, leading to reports of clinical depression and, unfortunately, suicides. Nearly 28% of students report having been bullied during the school year.<sup>21</sup> Of those, nearly half were harassed because of their looks and one-third because of their body shape.<sup>22</sup>

What used to be commonly accepted (an arguably a poor social norm) as a “rite of passage” and test of a child’s visceral ability to handle confrontation has become exacerbated by the introduction and proliferation of social media. Cyberbullying has intensified physical bullying and created a very concerning problem and new reality for today’s youth.

Whether low self-image and self-esteem contributes to one becoming bullied or is a result of being bullied is debatable. Regardless, at stake is a child’s self-esteem. However, if low self-esteem may put a child at greater risk of being a victim, then there is evidence to support that regular exercise can contribute to a child’s sense of self-worth and self-esteem by combating obesity and improving body self-image.<sup>23</sup> As a correlation, improved self-image may also help a child deal with the effects of bullying and other negative extrinsic influences.<sup>24</sup>

## Adolescence Is a World of Change

The adolescent years can effectively be characterized as a period wrought with social pressures and stigma, strong hormonal release, emotional highs and lows, enhanced perception of personal image and the need to create a sense of self-identity. There are a lot of stressful events facing the average adolescent, and mechanisms to assist with these stresses are very much needed. Of all intrinsic and extrinsic stressors, exercise can be a formidable tool in addition to mindfulness.

Body image is of great importance to adolescents of either gender. Exercise not only plays a role in maintenance of body fat composition and muscle development/toning, but also in the maintenance, health and development of the largest organ in the human body—the skin, with an average adult surface area of 18 square feet.<sup>25</sup> Exercise increases circulation, improves blood flow, causes perspiration, and boosts oxygenation, all of which help replenish nutrients to the skin and prevent dryness. Additionally, collagen production is increased which helps plump and maintain flexibility in the skin.<sup>26</sup>

Healthy coping with emotional highs and lows and transient depression during adolescence (especially in females) can have an impact on ability to effectively respond to similar stressors in early adulthood.<sup>27</sup> Exercise elicits the release of endorphins, which has a positive correlation to an overall improved mood and psychological well-being.<sup>28</sup> Endorphins impose an analgesic effect upon the body, and increases in physical activity promote continued endorphin release. Exercise and physical activity can have a similarly beneficial impact on symptoms of depression as do some antidepressant treatments.<sup>29,30</sup>

The social network for an adolescent helps promote a sense of identity and belonging; therefore it stands to reason that participation in group sports activities leads to increased levels of self-esteem and social



Antonio Guillem/Shutterstock.com



Pressmaster/Shutterstock.com

connectivity. Even non-organized, small groups of friends participating in social physical activities can have this same outcome. Involvement in exercise with friends can also serve as a sense of motivation for an otherwise “unmotivated” teen.

Exercise can also improve the immune system response, specifically in those prone to maladaptive stress responses.<sup>31</sup> Many adolescents, due to combined physiological and psychological forces mentioned earlier, put themselves in a compromised immune status due to proliferation of the sympathetic nervous system response. Lack of a mindful and healthy response to intrinsic and extrinsic stressors elicits this sympathetic response, which studies have shown compromise the immune system.<sup>31</sup>

## **ACTIVITY: CHILDHOOD EXERCISE AND ADOLESCENT BENEFITS**

*“The developmental decline and benefits of exercise are documented; however, relatively little is known about the mechanisms and motivations underlying adolescent exercise behavior.”<sup>32</sup>*

Identify some childhood exercise activities that can become exercise habits for adolescents

<b>Childhood</b>		<b>Adolescent</b>
<i>Example: Little League Sport</i>	→	<i>High School Sport/Intramurals</i>
<i>Example: Jogging With Parents</i>	→	<i>Recreational Outdoor Running</i>
	→	
	→	
	→	
	→	
	→	
	→	

In your opinion, what is the primary reason that inactive adolescents do not exercise?

How could that behavior be changed?

## Adulthood: Time to Renew or Implement Good Exercise Habits

Generally speaking, adulthood can be the busiest and most complicated period of our lives. Responsibilities are now aplenty, decisions now rest solely on our shoulders, financial burdens are newly acquired, and starting a family is either being considered or has already started, and navigation through a career has begun. In general, the adult terrain can be quite fast-paced and relatively unforgiving. As adults we are constantly being drawn in a dozen directions at once and our attention being pulled away from ourselves and required of others.

Being mindful of one's personal exercise needs, let alone finding time for exercise, can easily slide down the ladder of priorities. Ironically, this is the period of our lives where being mindful of, and attending to, our own personal, physical and mental needs will equip us to better handle the challenges lying ahead of us. This is crucial if we want to have a healthy and fruitful life when we are much older.

Chronic diseases and conditions are the leading causes of death and disability, according to the Centers for Disease Control and Prevention. The most commonly identified non-communicable diseases in the United States that account for nearly 7 of the top 10 causes of death are heart disease, diabetes, stroke, cancer and obesity.<sup>33</sup> In 2010 48% of adult deaths were caused by cancer and heart disease.<sup>33</sup> In 2012 it was reported that half of all American adults have one or more chronic health conditions.<sup>34</sup> The CDC further notes that, including arthritis, these are among the most common and preventable of health problems.



Monkey Business Images/Shutterstock.com

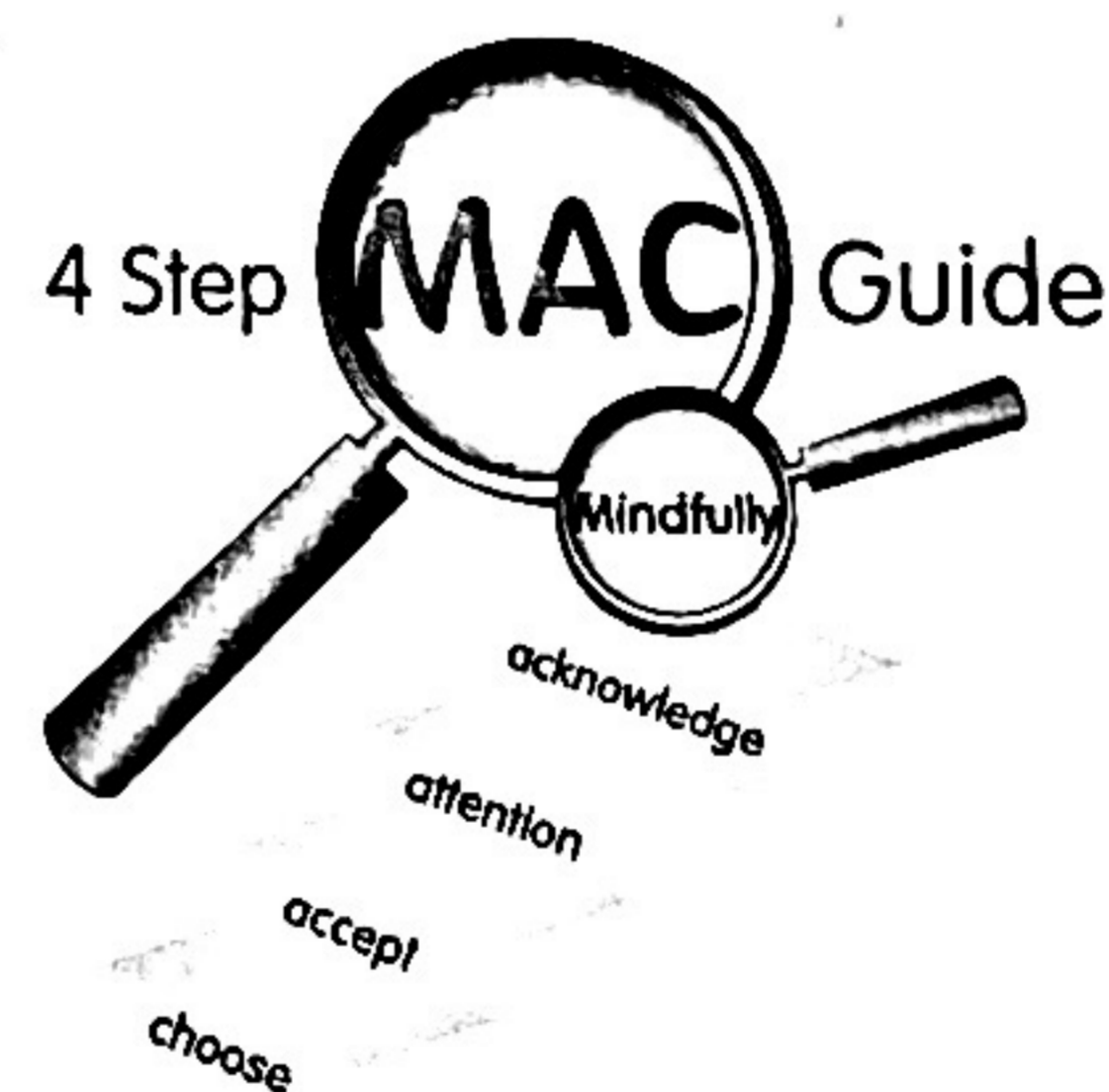


Photo courtesy of Maria Napoli

Overall, there is strong evidence that active adult men and women not only have lower rates of chronic disease states and conditions, they are better able to maintain a stable and healthy weight maintenance and as they become older are less likely to suffer hip or vertebral fracture.<sup>35</sup>

For those looking to start a family, it has been shown that obesity contributes to increased risk of female infertility<sup>36</sup> and that moderate exercise can help maintain male sexual libido.<sup>37</sup>

In addition to *making* time for exercise, it is important to recognize that opportunities for exercise are abundant and readily available in most people's everyday lives. If one were to categorize opportunities for adults to engage in physical activity, it may look something like this:

- Leisure time (swimming, hiking, gardening, walking, dancing)
- Occupational (blue-collar laborer, construction)
- Household chores
- Sports
- Planned exercise
- Family activities/Outings
- Community activities/Social involvement
- Commuting (walking, cycling)

Exercise may be an everyday occurrence for many, but the key is to maintain a consistency and regularity in activity to maximize benefits and allow exercise to become a routine. For some a change of venue may help contribute to establishing an exercise routine. Going to a gym, going outside, or finding a separate and unique location for one's exercise can provide a "personal" space and means of escape.

Becoming involved in group physical activities can be of benefit because it offers the social component that can serve as not only a motivator but also a distraction from the day's burdens.

## Older Adults: Relish and Maintain



Older adults stand to benefit from the health and wellness practices instituted when they were younger. Lifelong exercise habits exert influence on the perceived benefits and willingness to participate as we become older; however, at this point in life, it would behoove one to continue to look forward and make sure the body is a "temple" and not an "empty playground." Physical activity may be a bit less exciting and become bound by age-related constraints, but it does not hold any less value or short- and long-term gains.

Particularly in elderly populations, exercise has been shown to protect the brain from neurodegeneration by increasing synaptic plasticity and also by assisting with learning and memory.<sup>38</sup>

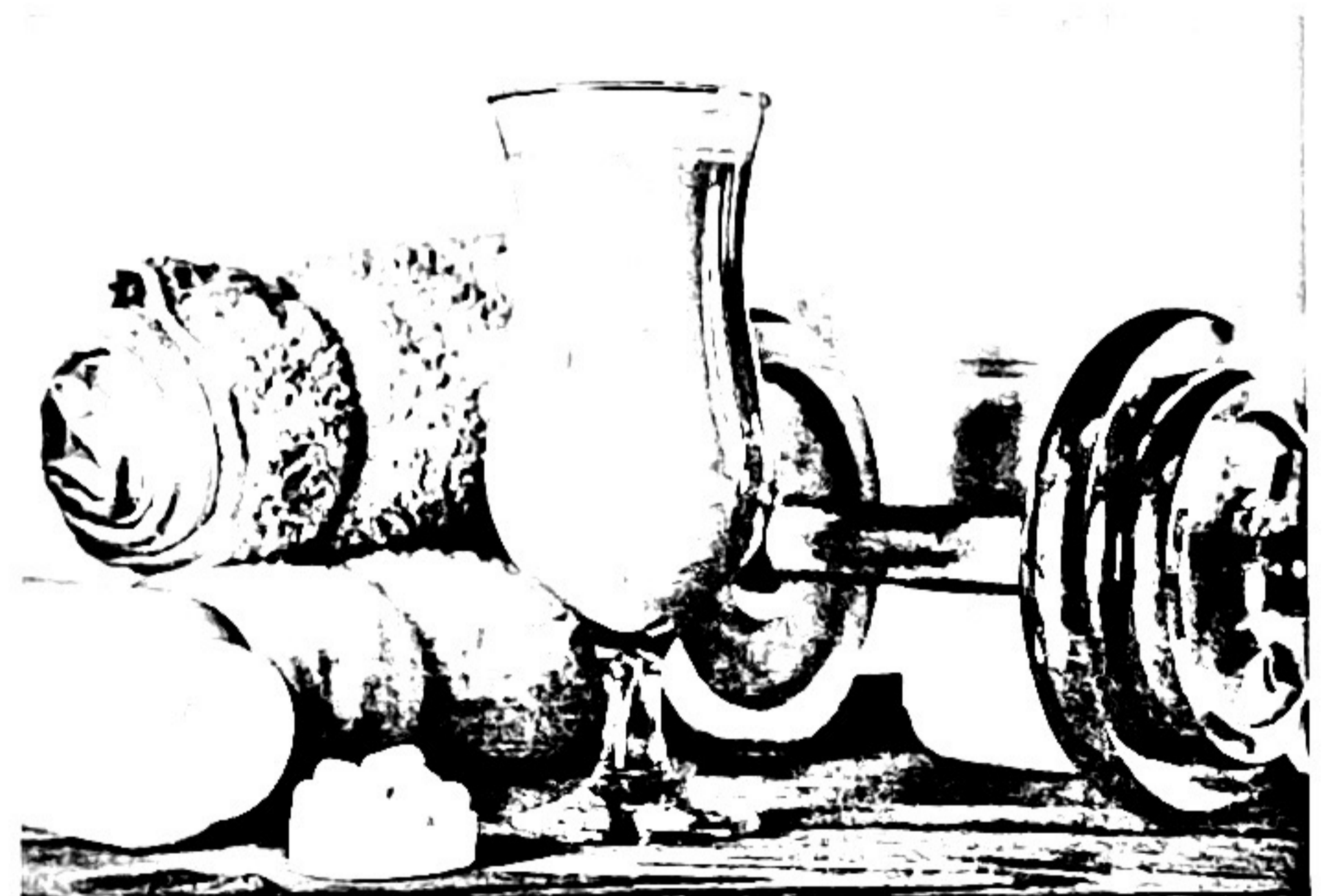
Loss of muscle mass and strength related to age contributes to increased disability (if applicable), frailty, and falls. Regular exercise for this age group can reduce the risk of osteoporosis and other age-related debilitating conditions, as well as improving sleep and reducing depression.<sup>39</sup>

Social support, accessibility, and safety<sup>40</sup> all play key roles in promoting exercise activities for this particular age group. Perceived barriers to exercise need also be broken down, as there are many types of physical activity one can safely participate in.

Aerobic Activities for Older Adults	Muscle-Strengthening Activities for Older Adults
<ul style="list-style-type: none"> <li>• Walking</li> <li>• Dancing</li> <li>• Swimming</li> <li>• Water aerobics</li> <li>• Jogging</li> <li>• Aerobic exercise classes</li> <li>• Bicycle riding (stationary or on a path)</li> <li>• Some activities of gardening, such as raking and pushing a lawn mower</li> <li>• Tennis</li> <li>• Golf (without a cart)</li> </ul>	<ul style="list-style-type: none"> <li>• Exercises using exercise bands, weight machines, hand-held weights</li> <li>• Callisthenic exercises (body weight provides resistance to movement)</li> <li>• Digging, lifting, and carrying as part of gardening</li> <li>• Carrying groceries</li> <li>• Some yoga exercises</li> <li>• Some Tai chi exercises</li> </ul>

## Nutrition and Exercise: Protein and Hydration

Ensuring the body receives its proper nutritional requirements during the course of exercise is, obviously, very important. Portion control, introduction of fruits and vegetables, and monitoring carbohydrate and fat intake are all crucial components. Exercise increases the body's nutritional demand substantially more than that of a sedentary lifestyle. Having a well-balanced, healthy diet with proper hydration will help 1) facilitate an effective exercise regimen, 2) reduce injuries, and 3) promote recovery. When these three components are addressed it is much easier to maintain an exercise routine and find enjoyment in it.<sup>41</sup>



FikMik/Shutterstock.com

Protein is not only important for muscle growth and tissue repair, but can also be a source of energy for those who are monitoring their carbohydrate intake. Protein slows the release of carbohydrates into the bloodstream and can prevent sudden spikes in blood sugar that can encourage fat storage and unstable energy levels,<sup>42</sup> as well as prevent skeletal muscle loss. For the mature and older adult, dietary protein needs increase with muscle-strengthening exercise.<sup>43</sup>

It is widely held that the average American consumes twice as much as protein as is required.<sup>44</sup> This is of concern because a sedentary lifestyle will not sufficiently utilize the protein and too much protein in the diet can increase dehydration and will be stored in the body as fat; consequently, many are not aware of some of the healthier sources of protein and where the greatest concentration of protein exists; this is important because of portion-control in the diet. Leaner, healthier sources of protein can be ingested in smaller portions than an unhealthy counterpart with a greater fat content.

## Healthy Sources of Protein<sup>42</sup>

It is important to be mindful of MSG, sodium, nitrates, and preservatives in any food item when trying to achieve maximum nutritional value.



alexpro9500/Shutterstock.com



nevodka/Shutterstock.com

### Dairy

- Greek Yogurt—18 g per 8 oz
- Cottage Cheese—14 g per ½ cup
- Swiss Cheese—8 g per 1 oz
- Eggs—6 g per 1 large egg
- 2% Milk—8 g per 1 cup
- Soy Milk—8 g per 1 cup

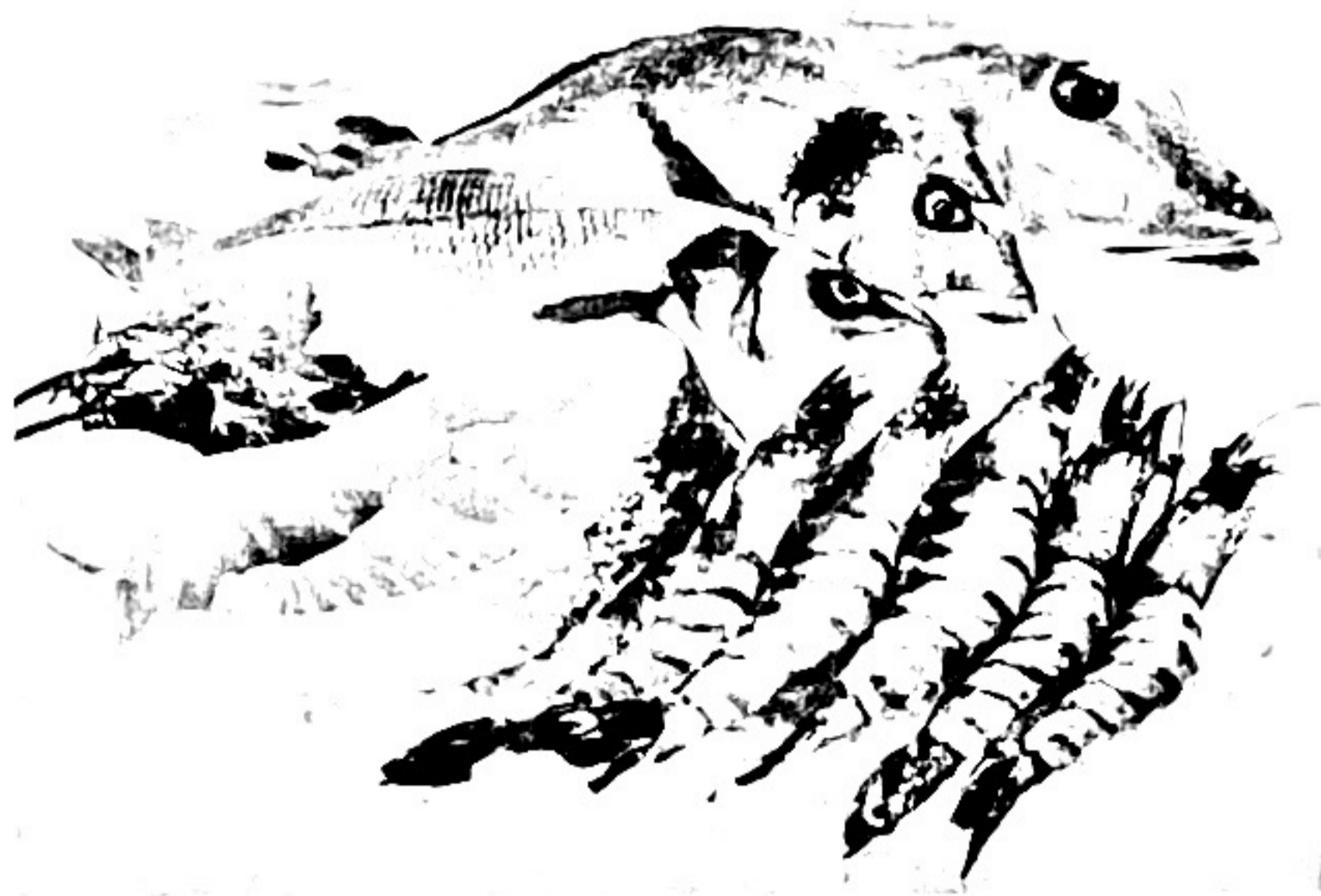


Isantilli/Shutterstock.com

### Meat

- Steak (lean cut)—23 g per 3 oz
- Ground Beef (90% lean)—18 g per 3 oz
- Pork Chops (boneless)—26 g per 3 oz
- Chicken Breast (boneless, skinless)—24 g per 3 oz
- Turkey Breast—24 g per 3 oz

Alexander/Shutterstock.com



Seafood

Yellowfin Tuna—25 g per 3 oz

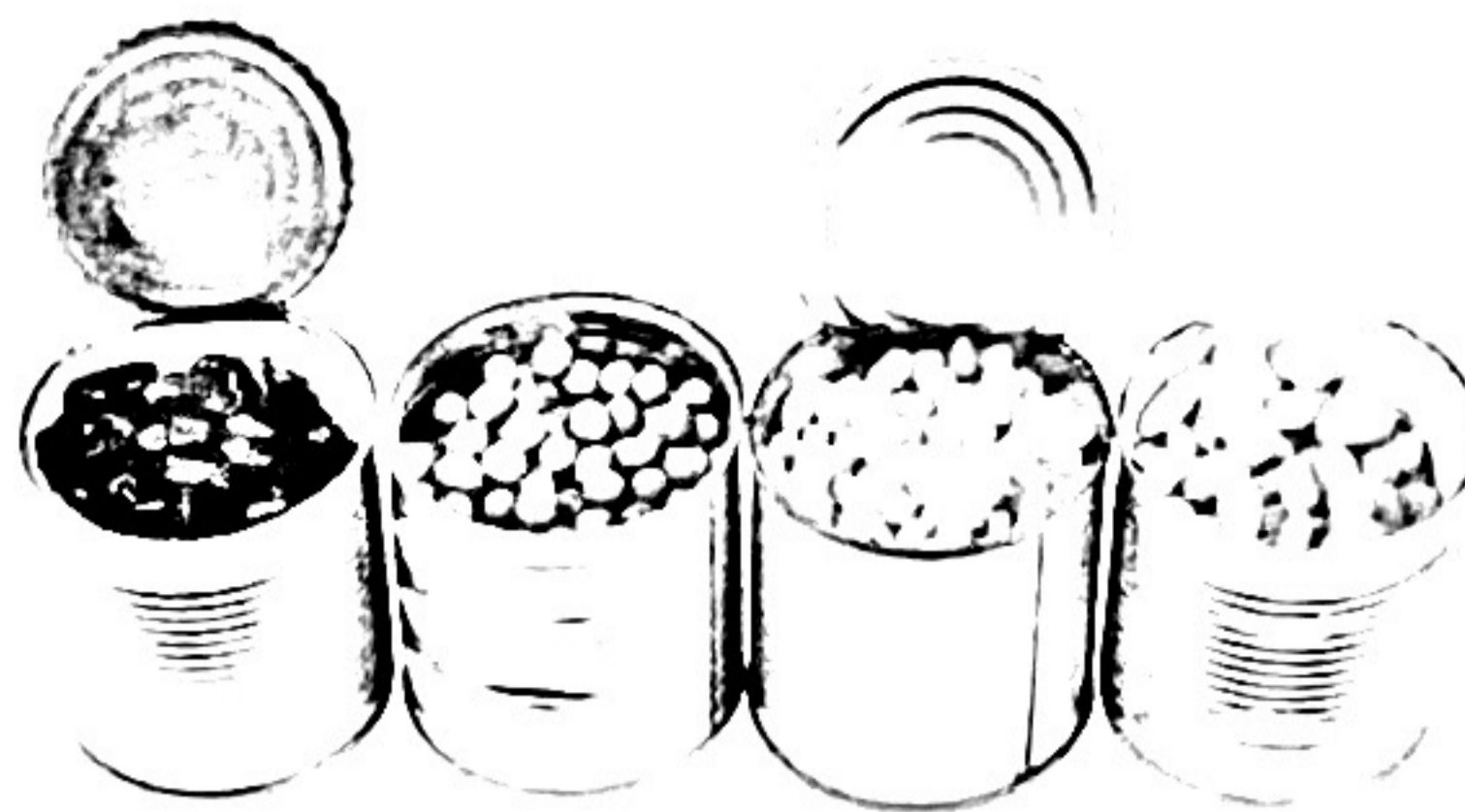
Halibut—23 g per 3 oz

Octopus—25 g per 3 oz

Sockeye Salmon—23 g per 3 oz

Tilapia—21 g per 3 oz

grynowd/Shutterstock.com



Canned Foods

Anchovies—24 g per 3 oz

Light Tuna—22 g per 3 oz

Chicken—21 g per 3 oz

Sardines—21g per 3 oz

Navy Beans—20 g per 1 cup

Dried Lentils—13 g per ¼ cup

Berents/Shutterstock.com



Deli Meats

Roast Beef—18 g per 3 oz

Roasted Turkey Breast—18 g per 3 oz

Madlen/Shutterstock.com

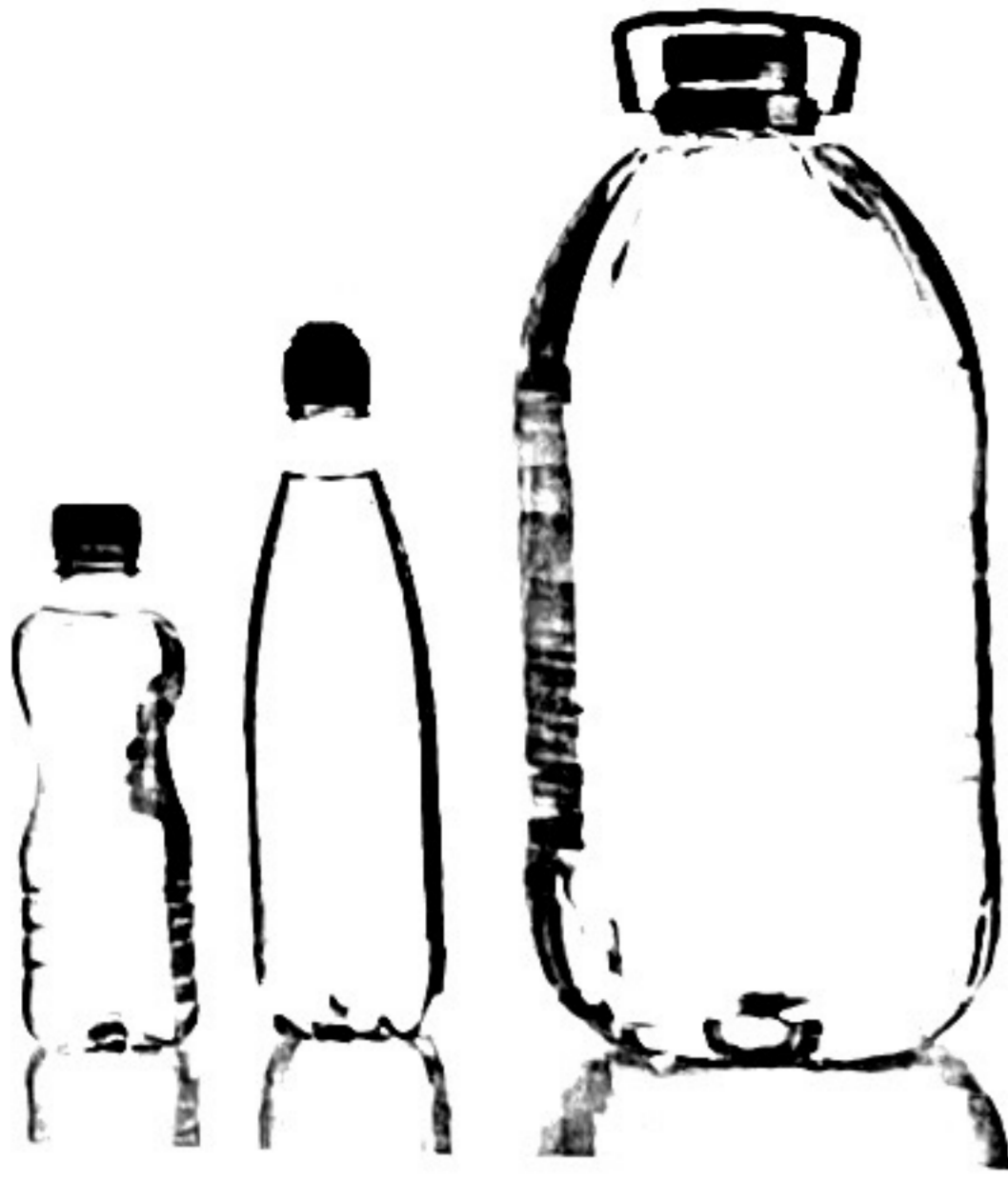


Grains

Wheat Germ—6 g per ½ cup

Soba Noodles—12 g per 3 oz

Quinoa—8 g per 1 cup



## Proper Hydration

The body's fluid intake, especially during periods of exercise, is essential because water helps regulate body temperature through sweating, it facilitates digestion and lubrication of joints and body tissues.

Exercise can lead to substantial water and electrolyte loss and sufficient replenishment can help maintain exercise performance. Improper replenishment can lead to dehydration with such signs as muscle fatigue, decreased energy, loss of coordination and heat illness.<sup>45</sup> The American College of Sports Medicine suggests the following guidelines:

Hydration Before Exercise	Hydration During Exercise	Hydration After Exercise
16–20 oz 4 hours before 8–12 oz 15 minutes before	3–8 oz every 15–20 minutes	Correct fluid losses within two hours—amount varies on amount of sweat

## References

1. Hippocrates. (n.d.). BrainyQuote.com. Retrieved February 14, 2015 from <http://www.brainyquote.com/quotes/quotes/h/hippocrate153531.html>
2. <http://www.barnesandnoble.com/> This was a Web site search to determine that this company offers over 60,000 titles in media and print within the “diet and exercise” category.
3. <http://www.bookdepository.com/> This was a Web site search to determine that this company offers over 15,000 titles under “exercise and workout books”.
4. Booth, F. W., Roberts, C. K., & Laye, M. J. (2012). Lack of exercise is a major cause of chronic diseases. *Comprehensive Physiology*.
5. Centers for Disease Control and Prevention: Division of Nutrition, Physical Activity, and Obesity. (DATE). <http://www.cdc.gov/nccdphp/dnpao/index.html>
6. Office of Disease Prevention and Health Promotion. (2008). *2008 physical activity guidelines for American's summary*. Accessed 12 Feb 2015. <http://health.gov/paguidelines/guidelines/summary.as>
7. Exercise. (n.d.) *Farlex Partner Medical Dictionary*. (2012).
8. Exercise. (n.d.) *Dorland's Medical Dictionary for Health Consumers*. (2007).