Army Physical Fitness Research Institute

APFRI Leadership, Health and Fitness Guide

U.S. Army War College

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Army Physical Fitness Research Institute

APFRI came into existence in 1982 following a 21 December 1981 General Officer Physical Fitness Conference at TRADOC HQ, with GEN Otis, CG, TRADOC, and LTG Richardson, DA DCSOPS, among the attendees. APFRI was designated as part of the Army's comprehensive physical fitness system to promote a "…philosophy that…soldiers and…leaders must be committed to an improved lifestyle through physical fitness." The Commandant of the U.S. Army War College agreed to establish and house APFRI which was given the mission to design motivational programs and engage in continuing research targeting physical fitness and health issues of relevance to strategic leaders.

APFRI is a leader development program focused on ensuring leaders understand the complex interplay between leadership, health and fitness. Since leaders set the tone, APFRI's innovative focus on mental and physical fitness as leader development helps ensure that both leaders and those they lead remain healthy, focused, and ready to support national security. APFRI's professional staff remains committed to providing students, staff, and faculty the most up-to-date information in a manner that is both relevant and responsive to their needs. A basic tenet of the APFRI program is that leaders also have a responsibility to mentor and coach those they lead so they too understand how their effectiveness and "command presence" as leaders are linked to their health and fitness. APFRI expanded its program to include senior enlisted and mid-career officers in 2005 and 2007, respectively. Since its expansion, APFRI assesses and educates over 5,000 leaders per year about threats to their physiological resiliency. APFRI provides students, staff, and faculty with comprehensive assessments, education, and intervention to improve the Leader's resiliency and ultimately demonstrating to them the link between Leadership and personal resilience. APFRI also provides educational programs and interventions throughout the academic year to promote and improve resilience among senior leaders and their spouses.

The APFRI staff, composed of experts who comprehensively integrate the physical, cognitive, and mental human dimensions of leader development, has combined their talents, efforts, expertise, and insights into a leader feedback form as a component of the Professional Military Education (PME) experience.

APFRI is committed to promoting the resilience of leaders to ensure their professional and operational readiness.

Leadership, Health and Fitness Development Guide

U.S. ARMY WAR COLLEGE

Commandant:
Major General Gregg F. Martin

ARMY PHYSICAL FITNESS RESEARCH INSTITUTE

Director:
Thomas J. Williams, PhD

Authors (Listed Alphabetically):
Marjorie J. Bessler, MEd, ATC
MAJ Daniel Blaz, FNP
M. Dee Connelly, RN, BSN
LTC Jamie Cornali, RN, MSN, FNP-C
Jennifer Eiland, MS, RD, LD
Gregory T. Ellermann, PhD
LTC Heidi C. N. Kaufman, MS, RD, LD
Christopher J. Kusmiesz, MS, ACSM-CES®
Shawn Kwak, DPT
Joseph G. Mallis, MS, MT(ASCP)
Melanie T. Richardson, MS, ACSM-HFS®
CPT Jessica Schultz, PhD
Robert W. Stanley MS, CSCS®, ACSM-HFS®
LTC John Via, PsyD
Thomas J. Williams, PhD
Collaborating Physicians:
Irwin M. Feuerstein, MD
Thomas J. Ostronic, MD

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Disclaimer: The general information in this guide is not intended to diagnose any medical condition or to replace your healthcare professional. Always consult your primary healthcare provider before beginning any exercise program or increasing physical activity. This is extremely important if you have been inactive for 6 months, are over the age of 40, or have any previous or existing injuries. If you experience any pain or difficulty with any of these exercises, stop and consult your primary healthcare provider.

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The views expressed in this guide are those of the authors and do not necessarily reflect the official policy or position of the Department of the Army, the Department of Defense, or the U.S. Government. This guide is cleared for public release; distribution is unlimited.

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Contributing authors: CPT Dave I. Cotting, PhD, LTC Ruth G. Crampton, RN, MS, BC, MAJ Gail A. Dreitzler, MPT, OCS, MAJ Lisa M. Giese, MS, RD, LN, SFC Thomas L. Goyt, EMT-B, LTC Stephen K. Hall, MSN, NP-C, MAJ Stephen P. Layman, MPT, MAJ Kelli M. Metzger, MS, RD, LD, CDE, Roberto Ruiz, MA, CSCS, HFI, MAJ Maurice L. Sipos, PhD, and Jerel M. Zoltick, MD.The authors would like to thank CPT Douglas Lowery and Holly Grove for their contributions in its production.

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Comments pertaining to this report are invited and should be forwarded to: Director, U.S. Army Physical Fitness Research Institute, U.S. Army War College, 122 Forbes Avenue, Carlisle, PA 17013-5244. Comments can also be conveyed by contacting APFRI at (717) 245-4511.

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Additional health and fitness information is available on the APFRI Homepage for electronic dissemination. APFRI's Webpage address is: *https://apfri.carlisle.army.mil*

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Foreword

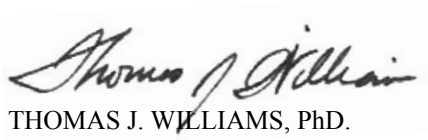
For almost ten years our Nation has been at war and we must confront the reality that we are in an era of persistent conflict. As leaders, you must balance this reality against the need to enhance your mental, physical, emotional, and spiritual readiness so that you are prepared and can sustain yourself for this certainty. As mid-career and senior leaders, you are constantly facing new challenges in sustaining your health and fitness, as well as the health and well-being of those you lead. You have taken an important step toward maintaining stamina, energy, and strength as leaders by taking advantage of one or more of the Army Physical Fitness Research Institute's (APFRI) comprehensive health, fitness, and mental readiness programs.

APFRI is committed to helping leaders promote the "...philosophy that...Soldiers and...leaders must be committed to an improved lifestyle through physical fitness." APFRI's professional staff remains committed to providing students, staff, and faculty the most up-to-date information about the complex interplay of leadership, health and fitness in a manner that is both relevant and responsive to your needs. A basic tenet of our program is that as leaders, you also have a responsibility to mentor and coach those you lead so they too understand how their effectiveness and "command presence" as leaders are linked to their health and fitness.

The APFRI staff, composed of experts who comprehensively integrate the physical, cognitive, and mental human dimensions of leader development, has combined their talents, efforts, expertise, and insights as a component of your Professional Military Education (PME) experience. This guide is intended to both supplement and complement the information you receive by participating in one or more components of the APFRI program. The sequence of information parallels, in large part, the sequence of information deemed important to maintain comprehensive well-being and a high state of mental and physical readiness. An important, but too often neglected component of leader development concerns the knowledge and understanding of how to mentor others in the areas of leadership, health, and fitness. Throughout this guide, the APFRI staff provide recommendations for lifestyle changes or other recommendations for yourself and subordinates whom you mentor. We hope that you will use these recommendations to guide your exercise program, to assess yourself, to help you better understand the types of interventions that may help, and/or to help you understand what type of risks may necessitate a medical follow-up with your primary care provider. An appendix is provided on a leader's role in mentoring health and fitness as a component of the learning continuum.

Thanks to ongoing advances in the various domains of readiness, our understanding of the areas addressed in this guide is constantly changing. Thus, while we hope you will use this Development Guide to increase your understanding of the complex interplay between leadership, health, nutrition, fitness, and stress, for yourself and those you lead, it is by no means intended for you to stop with this information. Rather, this information is an important component of your life-long education as a leader. We encourage you to find ways to share the information contained in this Developmental Guide with those you lead. Our hope and intent is that you will use this information to increase your understanding of and improve your own health and fitness, that we motivate you to better understand how your own leadership development is linked to your overall well-being, and that you clearly see that as a leader, you have a responsibility to ensure the health and fitness of those you lead as well.

The U.S. Army War College's Army Physical Fitness Research Institute is pleased to offer this Leadership, Health and Fitness Development Guide as a contribution to your increased health and readiness to ensure you are, "Fit to Lead."



THOMAS J. WILLIAMS, PhD.

Director, Army Physical Fitness Research Institute

Leader Resiliency Profile

SENIOR LEADER Age: 45
Date of assessment: 21 - Jun - 2011

Physiological Resiliency

Resting Heart Rate	63 beats/min		
Resting Blood Pressure	122/77 mm Hg		
≤ 119/79	120-139/80-89	≥ 140/90	
Glucose	85 mg/dL		
≤ 99	100-125	≥ 126	
Triglycerides	120 mg/dL		
≤ 149	150 - 199	≥ 200	
Total Cholesterol	199 mg/dL		
≤ 199	200 - 239	≥ 240	
High Density Lipoproteins (HDL)	53 mg/dL		
≤ 39	40 -59	≥ 60	
Low Density Lipoproteins (LDL)	116 mg/dL		
≤ 129	130 - 159	≥ 160	

Major Risk Factors That Affect Your LDL Goal

- [x] Age (men 45 or older; women 55 or older)
- [ ] High Blood Pressure (> 140/90 mmHg or treatment)
- [ ] Low HDL cholesterol (< 40 mg/dL)
- [ ] HDL is 60 or higher (subtract one from total)
- [ ] Family history of early heart disease
- [ ] Cigarette smoking

1 Total Risk Factors

Your Risk Category: Category III Moderate

Your LDL goal is less than 100 mg/dL

Prostate Specific Antigen (PSA) 0.020 ng/mL

Body Composition

Height 72.00 in Weight 183.00 lbs

Body Mass Index 24.87		
< 25	25 - 30	> 30
Waist Circumference 36.00 in		
≤ 40	> 40	
Army Tape Test (AR 600-9) 22.00 %		
≤ 26	> 26	
USAWC 50 %		
Bod Pod 26.00 %		
≤ 22.9	23 - 26.9	≥ 27
USAWC 55 %		

Physical Fitness

Sit and Reach Test 30.00 cm			
< 20%		≥ 90%	
USAWC 30 %		ACSM 50 %	
Leg Flexion 136.00	/ Extension 204.00	Ratio 0.67	
< .65	.65 - 1.0	> 1.1	
Bench Press 230.00	/ Weight 183.00	Ratio 1.257	
< 20%		> 80%	
USAWC 80 %		ACSM 90 %	

Aerobic Fitness

$V0_2$ Maximum Estimated 44.90 ml/kg/min		
< 20%		> 80%
USAWC 65 %		ACSM 60%

Training Heart Rate (THR) 70-85%

Training Range 122 to 149 beats/min

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Comprehensive Leader Resiliency Assessment

Introduction

The Army Physical Fitness Research Institute (APFRI) is a resident program based at the Army War College that addresses the Physical, Cognitive, and Moral Human Dimensions of leader development. APFRI is linked with the Professional Military Education (PME) to reinforce the learning continuum for each leader's personal and professional growth. The APFRI program also reinforces the connections between Comprehensive Soldier Fitness and leadership, noting that effective leaders often enhance resiliency by maintaining fitness domains in their lives, such as physical, emotional, social, family, and spiritual.

APFRI conducts a comprehensive assessment that links physiological markers to leadership. It is obvious that exercise, psychological resilience and nutrition contribute to the ideal leader's physical presence, energy, and stamina. You might not have known that these factors also optimize the ideal leader's brain fitness and intellect.

Our goal during the APFRI assessment is to use your comprehensive evaluation to help you better determine how your responsibilities as a leader often impact on your health and fitness levels. As you will discover, your comprehensive assessment is just the beginning of our program; the first step in improving or sustaining your overall health and well-being as a component of the guided self-development on the leader learning continuum.

The APFRI health and fitness assessment is offered as the ***first phase*** of a process to enable you to better understand the link between Leadership, Health, and Fitness. During the ***second phase*** of our process, you are encouraged to participate in voluntary coaching and mentoring programs, either in residence or through the Distance Learning Portal, to enhance your overall readiness and to reduce your risk of sudden cardiac death during the Army Physical Fitness Test (APFT). Once vulnerabilities are identified, APFRI offers aggressive strategies to train, educate, and coach leaders address a variety of needs including diet, weight reduction, stress/anger management, various measures of physiological resiliency, aerobic fitness and conditioning, and strength training. In the ***third phase*** of our process, we encourage you to take advantage of the opportunity to repeat portions of your initial assessment prior to graduating from your PME program. This allows you to reevaluate your health and fitness and to reflect on how your actions directly impacted on your health and fitness as a leader. The ***fourth phase*** of the the APFRI program occurs long after you graduate as part of an ongoing program evaluation of selected outcome measures at five year intervals, as permitted by funding.

If any of your APFRI assessment results identify high risk vulnerability (e.g., risk of cardiovascular disease), you are offered the opportunity for intervention by one or more of APFRI's Executive Programs based on the –risk factor(s) identified. The Executive Programs work collaboratively to offer participants a combination of readiness areas known to impact on physiological resiliency (e.g., health, nutrition, fitness, and stress management) as needed. APFRI's five Executive Programs are described below:

> **Executive Health Program (EHP):** This program focuses on indicators of physiological resiliency and helps to promote lifestyle changes in all leaders identified as being at high risk for sudden cardiac death during physical fitness (e.g., those who exceed national guidelines for hypertension, cholesterol, and glucose levels; use tobacco; have early indications of heart disease; and/or other medical conditions requiring referral to primary care providers).

Executive Nutrition Program (ENP): This program focuses on how a leader fuels their body for nutrition, stamina, and mental alertness. What a leader eats, when he/she eats, and how often they eat all can impact on both their cognitive and physical domains of readiness. APFRI offers dietary guidance, interventions, and recommendations for lifestyle changes to individuals at high risk for adverse consequences of "improper fueling" (e.g., CVD). Physiological resiliency areas of interest include: hypertension, hyperlipidemia, elevated glucose, excessive body fat, and/or poor dietary habits. The APFRI nutrition expert is also a resource for information on nutrition for physical and mental performance and optimization of eating habits for general health and longevity.

Executive Fitness Program (EFP): The fitness provides individualized assessment, training, education, and coaching in the physical domain to improve physical fitness levels in individuals with low aerobic capacity, low strength, and elevated body fat percentage. The EFP is also charged with developing interventions to restore optimal physical performance in those with injuries. The EFP staff administers injury prevention strategies for mid-career and senior leaders to decrease the incidence and severity of sports-related injuries.

Executive Enhancement Program (EEP): The EEP is focused on developing and strengthening the Cognitive Domain capacity of mid-career and senior leader with a focus on self-awareness, psychological hardiness, resiliency, and proactive stress management measures in order to both enhance leadership attributes and reduce the toxic components of Type A behavior, stress, and Operating Tempo (OPTEMPO) demands. The EEP is composed of the Leadership Feedback Program (LFP) and the Senior Leader Enhancement Program (SLEP).

Executive Distance Learning Program (EDLP): The EDLP provides an important interface between the resident and non-resident components of APFRI by providing a comprehensive, web-based program to target, identify, and provide one-on-one interventions to enhance performance and reduce identified risk factors from initial enrollment through graduation

The Relationship between Leadership, Health and Fitness

The relationship between leader effectiveness and health/fitness has roots at least back to the 1930s when descriptive theories of leaders found that, among other characteristics, leaders were found to have better health than non-leaders [1]. Since then, research has cited numerous historical examples of how poor health has negatively impacted the judgment and effectiveness of world-class leaders, especially in crisis or highly stressful contexts. Far too many of our military leaders do not allow themselves to embrace the lessons of many of our great leaders such as General George Marshall who said, "Leadership in the field depends to an important extent on one's legs, and stomach, and nervous system, and on one's ability to withstand hardships, and lack of sleep, and still be disposed energetically and aggressively to command men, to dominate men on the battlefield." [2] This quote captures well the focus of this leadership, health and fitness development guide. As General Marshall notes, a leader must remain strong, both physically and mentally; but build their endurance and resiliency; must develop and maintain the stamina required to lead and create a command presence. Marshall also emphasizes the importance of "sleep" for a leader's effectiveness. For example, we know that reduced sleep degrades one intellectual abilities, in particular in the areas of mental challenges, creative problem-solving, thinking

clearly, and both learning and remembering, all of which are important areas for PME and leader development. Reduced sleep also reduces one's mental agility potentially causing leaders to take more risks, making more bad decisions with lower overall performance. As leaders become more senior, they have more interpersonal demands placed on them and with reduced sleep, individuals become more pessimistic and irritable. Reduced sleep will also adversely impact a leader's physical abilities and health. For example, their immune system is weakened, they will have less energy metabolism (i.e., more sluggish and less alert in PME), more difficulties controlling their weight in part caused by increased food cravings, increased risk for cardiovascular disease, and decreased muscle/tissue repair. This brief review of importance of sleep to a leader's performance, health, and fitness provides a helpful exemplar for how leaders must understand and master the human dimension of warfare for optimal leadership effectiveness.

> "You have to lead men in war by bringing them along to endure and display qualities of fortitude that are beyond the average man's thought of what he should be expected to do. You have to inspire them when they are hungry and exhausted and desperately uncomfortable and in great danger; and only a man of positive characteristics of leadership, with the physical stamina that goes with it, can function under those conditions. Remember this: the truly great leader overcomes all difficulties, and campaigns and battles are nothing but a long series of difficulties to be overcome. The lack of equipment, the lack of food, the lack of this or that are only excuses; the real leader displays his qualities in his triumph over adversity, however great it may be." [3]

As these quotes from one of our Nation's greatest strategic leaders reveals, both strategic and mid-career leader responsibilities demand immense personal stamina. To be most effective, strategic leaders must be "at the top of their game" in almost all situations. Even if leaders have less than perfect health, increasing stamina can assist the leader in providing consistent energy output. Many organizations, including the Department of Defense, expend significant resources to improve health and fitness not only because of the altruistic benefits, but also because improvements in your fitness result in an increase in your stamina, thereby enhancing your effectiveness as a strategic leader.

Strategic work is both different and harder than what most senior leaders have faced before. This work is fundamentally centered on four basic functions [4]:

Developing an understanding of the nature of the volatile, uncertain, complex, ambiguous (VUCA), and political environment in which the organization must effectively function;

Developing, generating buy-in, and maintaining a strategic vision of where the organization will be in 10-20 years while also aligning missions along that vision;

Creating and leading structure, systems, and a culture that supports that vision, especially through crucial times in their history; and

Articulating and embedding values that empower all members of the organization while reinforcing the culture and vision.

Our point is straight-forward. Successful leadership demands considerable energy, health, and fitness. Managing complex internal systems and processes in the context of a "messy" external environment requires not only long hours, but also behavioral and cognitive functions that are just plain hard. For leaders to achieve success, both individually

and organizationally, requires that you be at the top of your game, both physically and cognitively.

Your selection to mid-career and senior-level schooling is clear evidence that you are at least in the top 10% of your year group/peers in terms of your leadership effectiveness: an achievement of which you should be justifiably proud. You have obviously focused effort on your development as a leader. You might find it beneficial to similarly concentrate on the "development" of your wellness, strength, and flexibility. The remainder of this leadership development guide provides you information on how your health and fitness levels can be improved so that you can be at your very best.

How To Use This Guide

The purpose of this guide is to assist you in interpreting the results of your health and fitness assessment and to summarize the APFRI Executive Programs that are available to you. The guide is organized to match "Your APFRI Leader Resiliency Profile" you were given during your out-brief. You will find that the topics in this guide are arranged in the same order as your profile if you move down the column on the left first followed by the column on the right. The sections below address age-specific risk factors as they relate to health and fitness. Each section describes why the variable is important, how it was measured, how to interpret the results, what you can do if you are at risk, and additional information.

Age

APFRI focuses on the mid-career and senior leader population because the risk for health problems increases as you approach the fourth decade of life. Middle-aged men (35-65) account for approximately one-third of all new heart disease cases and nearly one-fourth of all deaths resulting from heart disease. Heart disease is the number one killer of men and women however, the onset of heart disease in women occurs 10-15 years later than men. Ultimately, heart disease kills more women than men [5].

The body changes with age; your challenge is to understand these changes and engage in a healthy lifestyle to minimize the effects of aging. For example, research shows an association between increasing age and increasing obesity. Both men and women potentially gain 20 pounds between the ages of 25 and 55. This weight gain is generally attributed to a sedentary lifestyle and poor diet combined with a decrease in both bone and muscle mass that contributes to a slowing in metabolism.

Physiological Resiliency: Heart Rate

The normal range for resting heart rate is between 60-100 beats per minute. Resting heart rate is influenced by age, level of cardio-respiratory fitness, and certain environmental factors. Illness, medications, anxiety, sleep deprivation, over-training, caffeine, altitude changes, and tobacco may increase resting heart rate.

Resting heart rate will lower as aerobic fitness improves, and tends to raise with increasing age [5]. Individuals who are physically fit have a lower resting heart rate because their hearts and lungs are more efficient in delivering oxygen and nutrients to the working muscle than individuals who are unfit. The heart responds to exercise in similar ways as other muscle tissue, becoming more efficient and responsive to physical demands by working less to do more.

Physiological Resiliency: Resting Blood Pressure

Taking steps to reduce your blood pressure may save your life or increase your longevity with better quality years. According to the Seventh Report of the Joint National Committee (JNC) on Prevention, Detection, Evaluation and Treatment of High Blood Pressure [6], sustaining a reduction of 12 mm Hg in systolic pressure for 10 years will prevent one death in every 11 people treated for hypertension.

Blood pressure is the pressure exerted by the blood against the walls of the arteries. Systolic blood pressure (SBP) is the arterial pressure during the contraction (squeeze) phase of the heart cycle and is the top number recorded. Diastolic blood pressure (DBP) is the arterial pressure during the resting (refilling) phase of the heart cycle and is the bottom number recorded. Your blood pressure is normal only if it is below 120/80 mm Hg (See p. 10 for table). Recent data [6-7], suggests that a blood pressure below 115/75 mm Hg should be the new gold standard and levels above that could increase your risk of cardiovascular disease. The consensus is that the lower your blood pressure, the better, as long as you are otherwise healthy.

In 2003, the pre-hypertension category was added to national standards for blood pressure classification. The new category encourages early lifestyle changes to lower blood pressure. Pre-hypertension is identified as having a SBP ranging from 120 to 139 mm Hg or a DBP ranging from 80 to 89 mm Hg. If your pressure is in this category, it serves as a warning that your pressure is increasing and lifestyle changes are essential to avoid or delay the onset of hypertension [8]. In a recent study, researchers examined existing data from the Framingham Study and found that a pre-hypertensive person is three times more likely to have a heart attack and 1.7 times more likely to have heart disease than a person with normal blood pressure [9].

Hypertension (also referred to as high blood pressure) is any reading at or above 140/90 mm Hg and is diagnosed based on three resting blood pressure readings. Any readings in the hypertension category may be causing damage to your arteries and signal that medical evaluation and intervention is essential to prevent complications such as a stroke or heart attack.

Hypertension is an important risk factor for cardiovascular disease and leaders should take it seriously for that reason alone. However, because hypertension leads to arteriosclerosis and other conditions that impact the brain, one would suspect that hypertension might contribute to cognitive declines, too. This appears to be the case.

Over time cognitive abilities decline more in those with hypertension [10]. Middle-aged people with elevated systolic blood pressure have poorer memory for events [11]. For instance, systolic blood pressure has been linked to lower cognitive performance even in the pre-hypertensive range (120-139), but only for those in midlife [12]. It should be noted that at least one study did not observe a relationship between hypertension and cognitive abilities in women [13].

High blood pressure is a leading cause of cardiovascular complications, including heart attack, stroke, kidney failure, and vision loss. For most people, blood pressure will increase as they age. Current evidence shows that even people who have normal blood pressure at age 55 have a 90 percent chance of developing hypertension in their lifetime unless they actively take steps to prevent it [7]. Routine blood pressure measurement is essential due to the strong relationship between obesity and increasing blood pressure [14]. Because you face such a significant risk of developing high blood pressure during your lifetime, the APFRI Executive Programs offer a series of classes and programs that you may find useful in reducing your blood pressure.

Recent evidence points to an important link between psychological stress and hypertension [15]. Even mild stress has been found to increase blood pressure and impair the functioning of the cardiovascular system. Thus, for certain individuals, decreasing their levels of psychological stress may contribute in a positive way to decreasing their cardiovascular risk of hypertension. Likewise, chronically reduced sleep duration has been associated with adverse effects on blood pressure. The optimal sleep duration appears to be seven hours or more per night most of the time to prevent long term effects on blood pressure though more research is needed to confirm whether improving sleep quality will also lead to improvement in blood pressure [16].

Obesity coupled with hypertension predicts greater cognitive decline than obesity alone. In one study the impact was equivalent to 4.5 years of cognitive aging on neuropsychological tests [17]. Unfortunately medications that treat hypertension do not always lead to cognitive improvement, possibly due to side effects but the reason is unclear [18]. A reasonable conclusion is that while hypertension medications can literally be life-savers, for brain fitness the ideal solution, when possible, is to control hypertension through lifestyle changes including diet and exercise as outlined earlier in this guide. Regardless, hypertension must be controlled to preserve your overall health. Do not leave hypertension untreated and monitor it closely while under the care of a healthcare provider.

Blood Pressure Levels For Adults*

Category		Systolic (mm Hg)		Diastolic (mm Hg)
Normal		< 120	and	< 80
Prehypertension		120-130	or	80-89
Hypertension		> 139	or	> 89
	Stage 1	140-159	or	90-99
	Stage 2	160-179	or	100-109
	Stage 3	≥ 180	or	≥ 110

*Adapted from the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: NIH Publication No. 03-5230, National High Blood Pressure Education Program, May 2003

Dietary Approaches to Stop Hypertension (DASH)

In the late 1990s, the National Heart, Lung, and Blood Institute conducted a study of three dietary patterns [19]. The greatest reduction in blood pressure resulted from following a diet low in saturated fat, cholesterol, and total fat, with high emphasis on fruits, vegetables, low-fat dairy foods, whole grain products, fish, poultry, and nuts. This diet has since become known as the DASH diet (see chart on next page). The DASH diet is based on 2,000 calories a day, but meal plans and menus for lower and higher caloric levels are available within the DASH diet booklet to better target individual needs. The number of daily servings in a food group may vary from those listed, depending upon your caloric needs. Following the DASH diet for as little as 14 days could result in a reduction of 11 mm Hg systolic and 6 mm Hg diastolic blood pressure in people with hypertension and a reduction of 6 mm Hg systolic and 3 mm Hg diastolic blood pressure in people with pre-hypertension [20,21]. Following the DASH diet can also reduce your risk for cardiovascular disease by effectively lowering your total cholesterol, LDL cholesterol, and body weight

[13, 14]. A follow-on study in 2005 referred to as the OmniHeart Feeding Study [22], further modified the DASH diet with a higher protein content for one control group and a higher polyunsaturated fat diet (10% of energy respectively taken from carbohydrates) for the third control group as compared to the original DASH diet (55% of energy from carbohydrates). In this study, two-thirds of the protein came from plant sources of protein namely beans, nuts, and seeds and one third from chicken and egg whites. Individuals in the group eating the high protein version of the DASH diet had lower systolic blood pressure, LDL cholesterol, and triglycerides compared to baseline after 6 weeks on the diet while the individuals eating the high polyunsaturated fat version had more favorable HDL cholesterol levels [24]. Additional research has suggested that it may be equally effective to occasionally consume a high protein diet with the majority of the protein coming from very lean animal sources such as fish and chicken [23].

The 2010 Dietary Guidelines for Americans [22] promotes health and the reduction of risk for chronic diseases through diet and physical activity. APFRI's nutrition survey is based on these guidelines. A balanced eating approach with a higher emphasis placed on eating fruits, vegetables, and whole grains along with foods that are naturally high in nutrients and low in calories is recommended. This balanced eating approach is exemplified by both the USDA MyPlate and DASH eating plans. The MyPlate plan is a general eating approach, whereas the DASH diet focuses specifically on reducing hypertension. As a result, you may see differences in the daily servings of the food groups between the two plans.

*DASH Diet Guidelines Based on 2,000 Calories**

Food Group	Daily Servings (Except as Noted)	Serving Size Examples
Grains and grain products	6-8	1 slice bread 1 ounce ready-to-eat dry cereal** 1/2 cup cooked rice, pasta, or cereal
Vegetables	4-5	1 cup raw leafy vegetable 1/2 cup cut-up raw or cooked vegetable 1/2 cup vegetable juice
Fruits	4-5	1 medium fruit 1/4 cup dried fruit 1/2 cup fresh, frozen, or canned fruit 1/2 cup fruit juice
Low-fat or fat free Dairy foods	2-3	8 ounces milk 1 cup yogurt 1 1/2 ounces cheese
Lean meats, poultry, and fish	6 or less	1 ounce cooked lean meat, skinless poultry, fish, or 1 egg ***
Nuts, seeds, and dry beans	4-5 per week	1/3 cup or 1 1/2 ounces nuts 2 tablespoons peanut butter 2 tablespoons or 1/2 ounce seeds 1/2 cup cooked dry beans and peas
Fats and oils ****	2-3	1 teaspoon soft margarine 1 tablespoon mayonnaise 2 tablespoons salad dressing 1 teaspoon vegetable oil
Sweets	5 or less per week	1 tablespoon sugar 1 tablespoon jelly or jam ½ cup sorbet or gelatin 8 ounces lemonade

* Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: NIH Publication No. 03-5230, National High Blood Pressure Education Program, May 2003.

** Serving sizes vary between ½ cup and 1 ¼ cups, depending on cereal type. Check the product's Nutrition Facts label.

*** 2010 Dietary Guidelines state that eggs, in particular egg yolks, contribute many critical nutrients, therefore, one whole egg per day can benefit an overall healthy diet. However, since each egg yolk provides a significant amount of cholesterol (200 mg) and saturated fat (1.6 g), it is still wise to limit the number of eggs consumed per week and plan the menu such that other foods high in saturated fat that are traditionally served with eggs, i.e. bacon, sausage, cheese, are not contributing to an overall unhealthy amount of cholesterol and saturated fat each day. Also note that two egg whites have the same protein content as 1 oz of meat, and no fat.

**** Fat content changes serving counts for fats and oils: For example, 1 tablespoon of regular salad dressing equals 1 serving, 1 tablespoon of low-fat salad dressing equals ½ serving, and 1 tablespoon of fat free salad dressing equals 0 servings.

Lifestyle Modifications to Manage Hypertension*

Modification	Recommendation	Approximate SBP
Weight reduction	Maintain normal body weight (body mass index 18.5-24.9 kg/m^2	5-20 mmHg/10Kg weight loss
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and lowfat dairy products with a reduced content of saturated and total fat.	8-14 mmHg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride)	2-8 mmHg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week).	4-9 mmHg
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks (1 oz or 30 mL ethanol; e.g., 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) per day in most men and to no more than 1 drink per day in most women and lighter weight persons.	2-4 mmHg

*Adapted from the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: NIH Publication No. 03-5230, National High Blood Pressure Education Program, May 2003. The effects of implementing these modifications are dose and time dependent, and could be greater for some individuals.

APFRI recommends that you make the following positive lifestyle changes to improve resting blood pressure levels if you are hypertensive:

- Maintain a stable and healthy body weight throughout life.
- Consume a variety of fruits and vegetables, low-fat dairy foods, whole grain products, along with fish, poultry, nuts, and seeds.
- Reduce sodium intake to less than one teaspoon of salt (2300 milligrams) per day if your blood pressure is normal or 1500 milligrams per day if your blood pressure is elevated. The majority of sodium in American diets comes from processed food and the most significant sources overall are commercial breads, pizza, and mixed dishes including chicken or pasta [22]. Foods naturally high in sodium are also processed meats, cheese, bullion or broth based products. Read the Nutrition Facts label to identify the sodium content per serving if you frequently eat processed food.
- Commit to a regular aerobic and strength training program.
- Avoid all tobacco products.
- Limit alcohol consumption to less than 2 beers or 10 oz wine per day for men and less than 1 beer or 5 oz wine per day for women.
- Reduce stress.
- Sleep at least 7 hours per night.

For more information on the DASH Diet and MyPlate, visit the nutrition links provided on the APFRI website: ***https://apfri.carlisle.army.mil/web/education/links.cfm.***

Physiological Resiliency: Glucose

Glucose, or blood sugar, is the body's fuel that comes from food, especially carbohydrates. The principal role of carbohydrates is to supply energy in the form of blood glucose. Carbohydrates are the body's first choice for energy and should compose a majority of your food intake. During digestion, the carbohydrates you eat are converted into glucose before leaving the small intestines. Insulin, a hormone made in your pancreas, is needed to help the blood sugar enter your cells. Although every cell in the body depends on glucose to a certain extent, the brain and nervous system depend primarily on glucose for energy. Normal fasting blood sugar levels fall in the range between 70-99 mg/dL. If you have readings above or below the suggested level, you may need further medical evaluation and management since these readings may be an indicator of increased risk for diabetes, or other metabolic disorders.

It is important for leaders to monitor their glucose because diabetes has been associated with both cognitive decline [25] and with atrophy (i.e., "shrinkage") in the brain [26]. This is a serious health condition and leaders should remain alert to their risk of developing Type II diabetes if they want to preserve all of their cognitive edge.

Diabetes is a life-long disease marked by elevated levels of sugar in the blood. It can be caused by too little insulin (a hormone produced by the pancreas to regulate blood sugar), resistance to insulin, or both. Type 2 diabetes is the most common form of diabetes. In Type 2 diabetes, your body does not produce enough insulin or your cells ignore the insulin your body produces. Type 2 diabetes occurs mainly in adults greater than 40 years of age, although rates are increasing in the younger population as obesity rises. It is estimated that 1 in 3 Americans born in the year 2000 will develop Type 2 diabetes in their lifetime. Although the cause of diabetes is still unknown, genetics and environmental factors such as obesity and lack of exercise play a role. People with diabetes have a 2-4 times greater risk of cardiovascular disease as well as a significantly higher risk of peripheral vascular disease, stroke, hypertension, dyslipidemia, and obesity [27]. In many cases, risk factors for heart disease such as low HDL, hypertension, and obesity precede the development of diabetes. Diabetes is diagnosed after two fasting blood glucose tests with levels at 126 mg/dL or higher [28,29]. While many individuals experience a gradual onset of symptoms during the development of diabetes, others experience no symptoms at all. Symptoms may include: blurred vision; increased urination, thirst, appetite, and fatigue; unexplained weight loss; irritability; recurring skin, mouth or bladder infections; and slow-to-heal cuts.

The estimated prevalence of diabetes among American adults was 8.3% in 2011, although some minority groups have a much higher prevalence of diabetes than the population as a whole [30].

With "increased risk for diabetes," the blood glucose level is higher than normal, but not high enough to be diagnosed as diabetes. This standard classifies anyone with a fasting blood sugar level between 100 and 125 mg/dL as "increased risk for diabetes." By the time the body reaches this stage, cells have already begun to fail to respond to insulin in a timely fashion; this is referred to as insulin resistance. The insulin producing organ, the pancreas, responds to this inefficiency by releasing more insulin (hyperinsulinemia). With time, the pancreatic cells become exhausted and eventually defective, which in turn leads to Type 2 Diabetes. Some individuals feel "sugar sensitive." One sign of sugar sensitivity may be feeling sleepy within two hours of eating a meal, which is a good indicator to limit dietary sources of sugar and refined grains. Sugar and high fructose corn syrup in soft drinks and other sweetened beverages are important contributors to the epidemic of

obesity and diabetes in children and adults [31]. While age and genetics clearly contribute to insulin resistance, other controllable risk factors are abdominal obesity, inactivity, diet, smoking, and stress [32-36]. There is also evidence that inflammation and certain medications, including oral steroid, may result in insulin resistance [32]. In contrast, the high antioxidant content found in spices and herbs from the kitchen cabinet such as turmeric, cinnamon and basil may help to reverse insulin resistance, inhibit tissue damage and decrease inflammation present with high blood sugar levels. Also eating small amounts of dark chocolate and drinking moderate amounts of alcoholic beverages appear to exert positive effects on insulin action as well [37, 38]. (Refer to page 39 for more information on the health benefits and safe consumption of chocolate and alcohol.) Meta-analysis of 9 cohort studies and a recent prospective study in Germany with over 25,000 participating men and women aged 35 to 65 years looked at fiber and magnesium intake and found an inverse association with diabetes risk [39]. Those who consumed more fiber (an average of 29 grams per day) and magnesium through whole grain cereal, bread, and other grain products were less likely to develop diabetes than those who ate less fiber (an average of 15.1 grams per day).

Seventy nine million people in the United States twenty years or older are at increased risk for diabetes, placing them at a substantially greater risk for cardiovascular disease and death [40]. One in three Americans that are at increased risk for diabetes will go on to develop diabetes within a 5-6 year period. However, two large cohort studies demonstrated that people at risk for diabetes can reduce their risk up to 58 percent by making changes in diet and increasing their level of physical activity [41,42].

APFRI recommends the following positive lifestyle changes to prevent the development of diabetes:

- Maintain healthy weight or lose weight if you are overweight. As little as 5-10% weight loss can prevent the onset of diabetes.
- Commit to a regular aerobic and strength training program, as these types of activities are effective in glucose control. Regular exercise has an “insulin-like” effect that enhances the uptake of glucose [41].
- Choose a diet high in fiber from whole grains, and also rich in fruits and vegetables, while low in saturated and trans fat (see page 38 for more details).
- Avoid excessive calorie intake from low cost, low nutrient-dense food, particularly food sources of sugar and high fructose corn syrup (e.g. women consuming 1 or more sugar-sweetened drinks have a greater risk of developing Type 2 diabetes [42]).
- Eat 3 or more meals daily with predominant intake of calories early versus late in the day.
- Balance food intake with the amount of physical activity you perform.
- Avoid all tobacco products.
- Manage stress, a major contributor to abdominal fat and insulin resistance.
- Season food and beverages with basil, turmeric and cinnamon.

For more information about diabetes, visit the link to the American Diabetes Association provided on the APFRI website: ***https://apfri.carlisle.army.mil/web/education/links.cfm.***

Physiological Resiliency: Triglycerides

Triglycerides are the most common form of fat found in the food you eat as well as in the body. As dietary fat is digested, it is converted into triglycerides and released into your blood stream. Your liver also produces triglycerides from excess calories, regardless of the source.

Recent research has shown that elevated triglycerides are an independent risk factor for coronary heart disease [43]. Although no optimal level has been established, a triglyceride level less than 150 mg/dL is considered normal. Some of the most common causes of elevated triglyceride levels include weight gain, excessive caloric intake (especially sugar and alcohol), aging, some medications, medical conditions, and genetics. People who are obese, diabetic, or have metabolic syndrome are more likely to have elevated triglyceride levels.

Classification of Serum Triglycerides*

Classification	Serum Levels
Normal	<150 mg/dL
Borderline-High	150-199 mg/dL
High	200-499 mg/dL
Very High	≥ 500 mg/dL

*Adapted from the National Cholesterol Education Program, National Heart, Lung, & Blood Institute, National Institute of Health, NIH Publication Number 02-5215 September 2002.

APFRI recommends that you make the following positive lifestyle changes to lower triglyceride levels:

- If you are overweight, cut down on calories to reach your ideal body weight. This includes all sources of calories from fats, proteins, carbohydrates and alcohol.
- Reduce your intake of alcohol, particularly beer, considerably.
- Be physically active for at least 30 minutes on most or all days each week.
- Substitute monosaturated and polyunsaturated fats, such as those found in canola oil, olive oil or liquid margarine, for saturated and trans fats.
- Substituting carbohydrates for fats may raise triglyceride levels and may decrease HDL (“good”) cholesterol in some people.
- Limit your intake of refined carbohydrates, table sugar and foods with added sugar such as candy, cookies, cakes, and sweetened beverages and replace majority of your refined carbohydrates with whole grain and high fiber alternatives.
- Substitute fish high in omega-3 fatty acids for meats high in saturated fat like hamburger. Fatty fish like mackerel, lake trout, herring, sardines, light tuna and salmon are high in omega-3 fatty acids. Please see the caution about mercury content in seafood in the “Nutrition Tips to Reduce High LDL Cholesterol Levels” section.
- Add ground flaxseed, walnuts, and vegetable oils (primarily canola oil) to your diet.
- Avoid all tobacco products.

Physiological Resiliency: Total Cholesterol

Cholesterol is a fatty substance circulating in the blood that acts as a structural component of all human cells. The body produces about 75% of cholesterol in the liver, with the other 25% coming from food sources. High cholesterol affects one in every four adults and is one of the major modifiable risk factors for coronary heart disease [44]. Overall risk for developing coronary heart disease increases with higher blood cholesterol levels. A total cholesterol level less than 200 mg/dL is desirable.

Like blood pressure, high cholesterol levels are symptomless and discovered on standard screenings. Age and genetics can affect cholesterol levels. As we age, unless we take preventive steps to reduce it, cholesterol builds up in our arteries, leading to increased risk for heart attacks, strokes, and early death. Genes influence how much cholesterol is manufactured in the liver; therefore, high blood cholesterol often runs in families. However, a regular exercise program can help to increase your liver's ability to remove excess cholesterol. Lifestyle changes such as a healthy diet and increased physical activity clearly play a key element in controlling this risk factor for heart disease.

Physiological Resiliency: High Density Lipoproteins (HDL)

HDL is referred to as the "good" or "healthy" cholesterol because they remove cholesterol from the blood stream. HDL is cholesterol molecules combined with protein particles that transport cholesterol from the blood to the liver, where it is passed from the body. An HDL level of 60 mg/dL or more offers protection against heart attacks and strokes [45]. Most men in their 40s have HDL levels between 40-50 mg/dL, whereas most women in their 40s will have HDL levels between 50-60 mg/dL. In either gender, an HDL level < 40 mg/dL is considered a risk for developing coronary heart disease [46]. People with high triglycerides usually have lower HDL cholesterol. Progesterone, anabolic steroids and male sex hormones (testosterone) also lower HDL cholesterol levels. Female sex hormones (estrogen) raise HDL and protect against heart disease in premenopausal women . Research indicates that approximately 50% of your HDL level is based on your genetic composition. You can manipulate the other 50% with lifestyle choices. The major nonhereditary determinants of low HDL cholesterol levels are elevated blood glucose, diabetes, elevated triglycerides, very low-fat diets (less than 20% energy as fat), and excess body weight [44]. Research demonstrates that avoiding tobacco and performing moderate aerobic exercise regularly (at least 30 minutes on most days) can also increase your HDL level.

Although HDL cholesterol is commonly known as the "good cholesterol" due to its protective heart factors, higher HDL may also have protective cognitive benefits as well. Low HDL cholesterol has been associated with memory deficits in middle-aged people (ages 55-61), and declining levels of HDL have been associated with corresponding declines in memory. Possible explanations include HDL's role in regulation of amyloid beta protein metabolism and deposits, atherosclerotic disease and stroke, or its anti-inflammatory processes [47]. The importance of maintaining healthy levels of HDL for senior leaders is essential for overall heart health and cognitive functioning.

APFRI recommends that you make the following positive lifestyle changes to raise HDL cholesterol:

- Perform moderate to vigorous exercise for 30 minutes or more on most days of the week.
- Maintain a healthy weight or reduce weight by 5-10% if you are overweight.
- Avoid all tobacco products.
- Remove trans fatty acids or "partially hydrogenated vegetable oils" used to prepare commercially fried and baked products. For example, french fries, fried chicken, shortenings, some margarines, cookies, snack foods, doughnuts, frozen waffles, popcorn, crackers, etc.
- One to two alcoholic beverages per day can increase HDL levels, particularly dry red wine (a rich source of heart protective "resveratrol").
- Replace harmful saturated and trans fat with beneficial monounsaturated fats, typically found in the "Mediterranean" diet, such as oils produced from olive, canola, nuts, seeds, and avocado.
- Eat at least two good food sources of soluble fiber each day, such as oats, barley, pectin-rich fruits (e.g. apples, plums, and pears), vegetables, and legumes.

Physiological Resiliency: Low Density Lipoproteins (LDL)

Considered as the "bad" or "lethal" cholesterol; LDL significantly increases your risk of developing heart disease and is the primary target for cholesterol lowering therapy [43]. LDL is a type of lipoprotein that carries cholesterol and triglycerides in the blood stream where they can be used by the body. Excess LDL is the primary culprit for a cascade of events that cause the buildup of plaque in the arteries. The condition of plaque buildup is called atherosclerosis, and as it progresses, reduces blood flow to vital organs such as the heart and brain. Experts agree that lowering LDL cholesterol reduces the short-term risk for heart disease by as much as 40% and the long-term reduction in risk may be even greater. For every 10 mg/dL increase in your LDL level, your risk of a heart attack increases by almost 20% [44]. As the table on page 19 reveals, risk classification and its determination is complex and requires careful examination of both risk factors and Framingham Point Score (FPS) to determine recommended LDL goal levels. The National Cholesterol Education Program established the different LDL goal levels based on risk category as determined by your risk factors for coronary heart disease (see table on page 19). Coronary heart disease risk classifications are based upon the following risk factors: cigarette smoking, hypertension (blood pressure > 140/90 mmHg or on an antihypertensive medication), low HDL level (< 40 mg/dL), family history of premature coronary heart disease (male first-degree relative < 55 years of age; female first-degree relative < 65 years of age), and age (men > 45 years; women > 55 years). The FPS estimates your 10-year risk of developing coronary heart disease using a subset of these factors. However, recent research suggests that lifestyle changes must be an integral part of risk reduction and has established the therapeutic benefit for lowered LDL goal levels, particularly for individuals in the higher risk categories.

LDL Goal Levels as Determined by Risk Category[3]

Risk Category	Risk Determination	LDL Goal Levels
Very High	Presence of established CVD* & FPS**: > 20%	< 70 mg/dL
High	CHD*** or CHD Risk Equivalents**** & FPS: > 20%	< 100 mg/dL
Moderately High	2+ Risk Factors*****	< 130 mg/dL

*In addition to the presence of cardiovascular disease (CVD), (1) multiple major risk factors (especially diabetes), (2) severe and poorly controlled risk factors (especially continued cigarette smoking), (3) multiple risk factors of the metabolic syndrome (especially high triglycerides > 200 mg/dL plus HDL levels below 40 with total cholesterol minus HDL cholesterol < 130), and (4) patients with acute coronary syndromes.

** Framingham Point Score (FPS). A 10-year risk calculator for the development of CHD is available through the APFRI website *https://apfri.carlisle.army.mil/web/education/links.cfm*.

*** Coronary Heart Disease (CHD) includes history of myocardial infarction, unstable angina, stable angina, coronary artery procedures (angioplasty or bypass surgery) or evidence of clinically significant myocardial ischemia.

**** CHD Risk Equivalents include clinical manifestations of noncoronary forms of atherosclerotic disease (peripheral arterial disease, abdominal aortic aneurysm, and carotid artery disease [transient ischemic attacks or stroke of carotid origin or > 50% obstruction of a carotid artery]), diabetes, and 2+ risk factors with a Framingham Point Score > 20%.

***** Individuals at High Risk or Moderately High Risk are candidates for therapeutic lifestyle changes to modify the following risk factors regardless of LDL levels (obesity, physical inactivity, elevated triglycerides, low HDL, or metabolic syndrome).

Most people can lower their LDL cholesterol levels by making positive lifestyle changes such as reducing the amount of saturated fat and trans-fat in their diet. For example, consuming a diet rich in cholesterol-lowering foods (i.e., oily fish, soy food, whole grains and fiber, plant stenols, nuts and seeds) can be as effective as taking medication to lower LDL cholesterol [46,48]. Inflammation is now thought to be associated with numerous diseases, including CVD, diabetes, obesity, and rheumatoid arthritis. Eating a Mediterranean style diet with the addition of 1.5-3 ounces of nuts appears to prevent the oxidation of LDL-particles -- a process that makes the LDL more capable of damaging the thin cell lining of the blood vessels. Although all nuts and seeds are likely to have protective value, walnuts, almonds, and pistachios have in particular been shown in numerous studies to reduce the inflammation associated with CVD [49].

APFRI recommends the following positive lifestyle changes to improve your LDL cholesterol level:

- Maintain a healthy body weight.
- Consume a diet that is moderate in fat (20–35% of total energy intake), low in saturated fat (< 7% of total energy intake), low in cholesterol (< 300 mg per day), contains minimal trans fatty acids (< 3 grams per day), and is high in fiber (25-35 grams/day) particularly soluble (also called viscous) fiber provided by oats, barley, psyllium, pectin-rich fruit, and beans [3,14,39,40].
- Consume nuts as part of a heart healthy diet in amounts of about 1.5 oz per day. Consider daily substitution of nuts and nut-butters for animal protein in one meal or snack.
- Engage in a minimum of 30 minutes of aerobic exercise most days per week. Generally, if you begin an exercise program, you can expect an increase of approximately 5% in HDL and a decrease of 5% in LDL levels after at least 12 weeks of moderate aerobic exercise. Please refer to the Aerobic Conditioning section for more detailed information regarding aerobic exercise prescription.
- Avoid all tobacco products.
- Try to reduce your stress levels.

For more information about LDL cholesterol, visit the link to the National Cholesterol Education Program provided on the APFRI website: ***https://apfri.carlisle.army.mil/web/education/links.cfm.***

Prostate Specific Antigen (PSA)

PSA is an enzyme produced only by the prostate gland. The prostate gland is a doughnut-shaped gland located in a man's pelvis in the small space between the base of the penis and the bladder. The prostate makes the fluid that nourishes sperm and carries sperm during ejaculation. PSA circulates in a man's blood. In general, PSA levels in your blood increase due to physical changes to the structure of the prostate which is most often caused by trauma, infection, inflammation, prostate manipulation, benign prostatic hypertrophy (BPH), or malignancy. This "change in structure" influence on PSA levels is one reason we ask you to refrain from sexual activity, bike riding, or any activity that may stimulate the prostate for 48 hours prior to your PSA test. That may help to ensure greater accuracy of the test results. The sensitivity of PSA levels to these changes serves as the basis for the clinical use of the PSA test.

The PSA screening is used to both explore the relationship of PSA and cholesterol, activity, and lifestyle factors and to provide you an opportunity for APFRI staff to educate you about the PSA and reducing your risk of prostate cancer. Prostate cancer has become the most commonly diagnosed cancer among men in the United States [50]. It is the second leading cause of cancer deaths of men in the US. It is important to understand that your risk factors for prostate cancer will increase with age. The use of the PSA blood test to screen for prostate cancer is not without controversy. Prostate cancer is the most common form of cancer found in older men. While 30,000 men die from prostate cancer each year in the U.S., only 1 in 100 prostate cancer deaths occur in men under age 55. Men in the United States have about 1 chance in 6 of eventually being diagnosed with prostate cancer. African

American men and men with a father, brother or son with prostate cancer have a higher risk while Native American and Asian American men have a substantially lower risk. Men who have regular PSA tests have a higher chance of finding out they have prostate cancer while men who do not have PSA tests have a lower chance but higher probability of more advanced cancer when ultimately diagnosed. Because PSA screening can find cancers that may become life-threatening in 5 to 25 years, there has been increased usage of the test in 40 to 50-year-olds. But the test can also discover cancers that never become life-threatening, perhaps in up to 30% of the cases. A high PSA may result in your health care provider ordering a biopsy of your prostate which has its own risks (e.g., infrequent but serious problems such as rectal or urinary hemorrhage, infection, or urinary retention). A recent European Study released in 2009 has resulted in controversy surrounding the use of the PSA as a screening measure. This study tracked over 182,000 men between the ages of 50 and 74 in 7 European countries who were randomly assigned to PSA screening group or no screening group. In the 9 year follow-up, there was a 20% lower rate of death in the PSA screening group compared to the control group who did not receive PSA screening. However, the PSA screened group did have greater risk for over-diagnosis and other procedures. Studies have shown that the amount of PSA produced by the prostate gland can be helpful in detecting prostate cancer very early, especially when used in conjunction with a digital-rectal exam (DRE). APFRI completes PSA testing on males 40 years of age and over to provide you a baseline for your PSA level because some studies have reported that the rate or velocity of change in PSA over time is an important indicator of risk for prostate cancer. APFRI realizes the importance of knowing your age-specific PSA levels and race-specific PSA risk factors. While, as noted above, normal levels are known to increase with age, APFRI recommends follow-up with a health care provider for any individual with a PSA above 2.0ng/mL.

Body Composition

APFRI assessed your body composition using a variety of measures to include height, weight, body mass index, waist circumference, the Army Circumference Test, and air displacement plethysmography (Bod Pod®). Your body composition can be divided into lean mass and fat mass. Lean mass includes muscle, water, bones, and some organs. Fat mass is comprised of both essential body fat and stored body fat. Essential body fat is the minimal amount of fat required for normal physiological functioning. This fat is stored in bone marrow, the heart, lungs, liver, spleen, kidneys, intestine, muscles, and lipid rich tissues of the central nervous system. Stored fat is the body fat that accumulates in various places on your body making clothes fit tighter and body weight increase. Maintaining a high percentage of stored fat is highly correlated with increased incidence of certain cancers and heart disease; a risk that is reduced with a sensible diet and consistent exercise [51].

Leaders understand their body composition influences the first impression they make and their "leader presence" later. However, they might not know that maintaining a healthy weight might also improve their thinking and decision making. It turns out body composition is also an important component for brain fitness. This starts early in life. Children and adolescents with healthy body composition outperform their obese peers on cognitive tasks even after controlling for other factors [52]. Obesity, as measured by the Body Mass Index (see below), has also been associated with cognitive declines in middle aged adults [53,54] as well as accelerated brain atrophy [55]. Another interesting study found that people with higher percentages of body fat were not as good

completing cognitive tasks when under stress [56]. It stands to reason that maintaining a healthy weight will not just help a leader's physical appearance and energy; it might also optimize that leader's thinking, especially when under pressure. While being overweight impacts brain fitness and cognitive performance by itself, more often the effects are exacerbated by other conditions related to obesity including hypertension, diabetes, and cholesterol (please see those sections for additional information).

With age, you will gradually lose lean muscle mass and tend to gain body fat. As early as your late 30's, the amount of lean muscle mass in your body will begin to decline, thus slowing your metabolism and resulting in an increase in body fat. Therefore, your percent body fat reflects aging, physical activity levels, and nutritional practices.

Weight

Obesity has reached epidemic levels in the United States [57]. According to the National Center for Health Statistics, 66% of Americans are overweight or obese and over 25,000 Americans die of obesity related diseases each year. Obesity contributes to four of the leading causes of death in the United States, including our Nation's biggest killer: heart disease. Furthermore, obesity is now the leading cause for cancer in America [58]. Being overweight can result in a three to seven-year reduction in life expectancy [59]. The obesity problem is no longer isolated to the "western world" but rather the "western lifestyle" dominating worldwide in urban areas where the prevalence of obesity and diabetes is escalating in pandemic proportions [60]. Moderate weight loss can reduce or prevent the risk for serious medical conditions such as cardiovascular disease (CVD), diabetes, metabolic syndrome, sleep apnea, and some cancers (esophageal, pancreatic, kidney, endometrial, breast, rectal, and colon). As such, maintaining an appropriate body weight, throughout life, is vital to overall health and fitness.

If you are overweight, The Army Weight Control Program (AR 600-9) [61] recommends losing 3-8 pounds per month and is consistent with the current clinical guidelines. The national clinical guidelines recommend a weight loss of 1-2 pounds per week for up to six months [62]. It is, however, extremely worthwhile to lose any excess weight and even more important to maintain the achieved weight loss long term. Start with a modest goal of losing 5-10% of initial body weight. A weight loss rate of 1-2 lbs per week is safe, realistic, and produces significant health benefits. After achieving the initial goal, it is best to stop and evaluate if it is realistic to make additional lifestyle changes to achieve another 5-10% weight loss. Long term success is, in clinical terms, defined as sustaining a 10% weight loss for at least one year [63].

Body Mass Index

Body Mass Index (BMI) is an indirect measure of body composition that assesses your weight relative to your height (See Appendix 1 for BMI Table) and is expressed in kilograms of body weight per meter in height squared (kg/m2). Using BMI to assess weight-related risk has gained worldwide acceptance due to the relationship between BMI, percent body fat, disease risk, and mortality [64]. Limitations of using the BMI include overestimation of body fat in athletes and underestimation of body fat in older persons and others who have lost lean mass [65]. Nevertheless, BMI correlates highly with percent body fat in most participants. Classification of BMI and associated health risk are presented in the table below.

Classification of Body Mass Index and Associated Health Risk [29]

Classification	BMI	Health Risk
Underweight	< 18.5	Increased
Normal weight	18.5-24.9	None
Overweight	25.0-29.9	Increased
Obesity (Class I)	30.0-34.9	High
Obesity (Class II)	35.0-39.9	Very High
Obesity (Class III)	≥ 40.0	Extremely High

BMI greater than or equal to 25 kg/m2 is associated with an increased risk for both disease and mortality. Nearly half of the individuals between the ages of 20-25 who have a normal BMI will be overweight by the age of 60 to 69. Active people with a BMI less than 25 kg/m2 have a lower risk for CVD mortality compared to those who are inactive with a BMI greater than or equal to 30 kg/m2 [63]. APFRI research has shown that higher BMI values are usually associated with larger waist circumference, higher body fat percentage, higher systolic and diastolic blood pressure, as well as increased total cholesterol, LDL, triglyceride, and glucose levels. In contrast, lower BMI values are usually associated with greater aerobic capacity and HDL levels.

When evaluating your health risk, it is important to look at your BMI in the context of your body composition [66]. Some people have an increased BMI due to increased muscle mass. A person who has a higher BMI but a lower body fat percentage does not have the same health risk as a person with a similar BMI but higher body fat. Trends in APFRI research reflect an increase in body weight of 7.5 lbs (3.4 kg) over the past 20 years. Similarly, BMI has increased by 1.1 kg/m2. However, the increases in weight and BMI have not been accompanied by a corresponding increase in body fat percentage, suggesting that lean muscle mass accounts for the majority of this difference. This conclusion is also supported by the fact that the average APFRI male research participant 20 years ago was able to lift just 88% of his body weight on the bench press, while today's average male student can lift significantly more of his body weight. These findings suggest that BMI must be considered along with other indicators of health and fitness for today's active military population.

Army Circumference Test (ACT)

The Army Circumference Test or "tape test" was administered in accordance with Army Regulation 600-9 (AR 600-9) to estimate your percent body fat and to let you know where you are in terms of Army standards [61]. Men 40 years or older are allowed a maximum of 26% body fat and women of the same age are allowed a maximum of 36% body fat. In the 28-39-year-old category, males are allowed a maximum of 24% body fat and females are allowed 34% body fat. Although many Soldiers think the ACT does not accurately measure body fat, APFRI research has shown that it is a very conservative test that typically underestimates body fat percentage in all but the fittest male participants. The difference in percent body fat determined using the Bod Pod® (addressed in section below) and the ACT was significantly less in the fittest males, indicating that the ACT is more accurate in those who perform a higher frequency of both aerobic and strength training (see figure below). The ACT is an excellent tool to monitor body composition when more sophisticated tools

are not available. APFRI research supports the validity of using the ACT as a good way to monitor the physical changes that occur over time. In addition, it is the only authorized means for use to enforce AR 600-9 standards [61].

Air Displacement Plethysmography (Bod Pod®)

APFRI also measures body composition using the Bod Pod® Body Composition System. The Bod Pod® is a dual-chambered, fiberglass plethysmograph that determines body volume by measuring changes in pressure within a closed chamber. Since air displacement plethysmography is based on the same whole-body measurement principle as underwater weighing, the Bod Pod® first measures a person's mass and volume. After successfully measuring body volume, lung (thoracic) gas volume is either measured or estimated. From these values, whole-body density is determined and percent body fat and percent lean mass are calculated. In general, the error range of the Bod Pod® is + /- 2% of underwater weighing, which is considered to be the gold standard of body composition measurement [67].

Categorization of Total Body Fat Levels*

Category	Men			Women		
	30-39	40-49	50-59	30-39	40-49	50-59
Risky (low body fat)	≤ 5%	≤ 5%	≤ 5%	≤ 15%	≤ 15%	≤ 15%
Ultra Lean	6-13%	6-16%	6-17%	16-17%	16-18%	16-20%
Lean	14-16%	17-19%	18-20%	18-19%	19-22%	21-25%
Moderately Lean	17-19%	20-22%	21-23%	20-23%	23-26%	26-29%
Excess Fat	20-24%	23-26%	24-27%	24-29%	27-31%	30-34%
Risky (high body fat)	≥ 25%	≥ 27%	≥ 28%	≥ 30%	≥ 32%	≥ 35%

*Adapted from ACSM's Guidelines for Exercise Testing and Prescription, 8th ed [30]

A healthy body fat (comprised of both essential and stored fat) percentage range is between 6 and 23% for men, and 16 and 29% for women (see table above). APFRI research has shown that a lower body fat percentage determined using the Bod Pod® is associated with higher aerobic capacity and greater upper body strength. In contrast, a higher body fat percentage determined using the Bod Pod® is associated with higher total cholesterol, glucose, and triglyceride levels.

Waist Circumference

Waist circumference is an estimate of abdominal fat located in the body cavity beneath the abdominal musculature [68]. Men with a waist circumference greater than 40 inches (102 cm) and women with a circumference greater than 35 inches (89 cm) are at increased risk for coronary heart disease, diabetes, colorectal cancer, and increased blood pressure. APFRI research has found waist circumference to be a strong predictor of overall health and

fitness. Specifically, smaller waists are associated with increased aerobic capacity and HDL levels. In contrast, larger waists are associated with higher blood pressure, total cholesterol, LDL cholesterol, triglyceride, and glucose levels. Finally, our research has revealed a significant relationship between waist circumference and abnormal multi-slice computed tomography (MSCT). Males with a waist circumference greater than 40 inches are 4.2 times more likely to have an elevated MSCT score. Both BMI and waist circumference are important in determining your health risk. Having a waist circumference of greater than 40 inches if male, or greater than 35 inches if female, puts you in one risk category greater than that defined by your BMI (see BMI table Appendix 1) [66]. For example, a man who is 5'10" and weighs 180 pounds will have a BMI of 25.8 which places him in the increased health risk category. If he also has a waist circumference of 41 inches, he would be considered to be at high risk, rather than increased risk, for developing diabetes, cardiovascular disease, colorectal cancer, and high blood pressure [65]. An increased waist circumference is a stronger marker for cardiovascular risk than BMI because a high waist circumference reflects accumulation of abdominal fat close to the heart and metabolically active organs like the liver and pancreas. Even in persons of normal weight, a high waist circumference is an independent risk factor, often associated with stress and in men over 40 years of age [68].

Effect of Positive Lifestyle Changes on Body Composition

Change is often difficult, but when small steps are taken, the dividends pay off in the long term. APFRI recommends that you make the following positive lifestyle changes to improve your body composition.

Commit to a regular aerobic and strength training program. APFRI research has found that male participants who reported a higher frequency of both aerobic exercise and strength training had significantly smaller waist circumferences and significantly less body fat than those who reported a low frequency of exercise. Furthermore, students who participated in the APFRI Senior Leader Fitness Program reduced their percent body fat and waist circumference by increasing the frequency of both aerobic exercise and strength training, emphasizing the importance of a balanced physical fitness program. Consequently, strength training combined with aerobic exercise helps control your body fat and will decrease your risk factors for cardiovascular disease.

Maintain healthy weight or lose weight if you are overweight. Weight loss of no greater than 1-2 pounds per week is recommended to reduce body fat while sparing lean body mass loss. Creating a 3,500 calorie deficit, through a reduction of fat and/or carbohydrates is the key to losing one pound of fat.

The most successful way to decrease body fat is to combine an increase in exercise/activity level with a reduction in caloric intake. The weight lost from dieting is 75% fat and 25% fat-free mass (muscle, bones, water). The combination of exercise and diet can cut the loss of fat-free mass in half. It is imperative to perform strength training exercises or some form of weight bearing activity regularly to prevent muscle loss. Recent studies have demonstrated that when exercise is added to a weight loss program that uses a higher-protein diet intervention, reduction in body fat and sparing of muscle mass is greater [70]. Research has also demonstrated that an even distribution of high quality protein throughout the day is more beneficial for muscle growth, repair, and even diabetes prevention [71]. The optimal protein intake for healthy weight and fitness depends on individual differences such as gender, age, activity, and muscle development, however, in general, an even distribution

of about 25-30 grams of high quality protein in each third of the day seems more beneficial than consuming a large amount at one meal per day [69,71,72]. A high protein to energy ratio is readily achieved through use of whole grains, low-fat dairy, legumes, nuts, seeds, eggs or egg whites, and very lean meats in healthy portions. Protein supplements, on the other hand, often contribute excess calories and are not necessary to achieve an optimal protein to energy balance.

Consume the daily recommended amount of calcium. Consuming an adequate amount of calcium not only can help lower your blood pressure, but also may reduce your waist circumference. More importantly, a diet high in low fat or fat free dairy (3 servings daily) enhanced weight loss better than a diet with calcium supplementation or a low dairy diet without calcium supplementation. Individuals following a high low fat or fat free dairy diet lost 10 pounds more than individuals in the other diet groups and lost 47% more weight in the waist region [70]. In a recent study, individuals on a calorie restricted diet who consumed yogurt were able to decrease their percent body fat and waist circumference while maintaining their lean muscle mass [69]. There is, however, no evidence that consuming dairy and/or calcium above the recommended level is beneficial for weight loss.

Weight loss induced by a calorie-restricted diet reduces mortality and improves many metabolic risk factors associated with cardiovascular disease (blood pressure, lipids, insulin sensitivity, inflammatory markers, thyroid hormones, etc.). In contrast, removal of large amounts of subcutaneous body fat by liposuction does not improve insulin sensitivity or other metabolic risk factors for cardiovascular disease. Therefore, calorie restriction is the cornerstone of weight reduction and obesity treatment [73].

For more information about nutrition and fitness, visit the links provided on the APFRI website: ***https://apfri.carlisle.army.mil/web/education/links.ctf.***

Metabolic Syndrome

The metabolic syndrome is not a disease, but a clustering of conditions (see table below) that nearly doubles the risk for developing diabetes, coronary heart disease, and stroke [74]. The National Cholesterol Education Program identifies individuals with metabolic syndrome as having at least three of the following five indicators: high triglycerides, low HDL, abdominal obesity, hypertension, and/or elevated glucose. It is estimated that between 32-35% of American adults meet the criteria for metabolic syndrome [78]. The prevalence for metabolic syndrome increases with age and affects approximately 15-20% of Americans in their 20s and up to 51-54% of those in their 60s [75]. Several studies clearly demonstrate that metabolic syndrome results from a poor diet and low fitness levels [76]. In a recent study that measured cardio respiratory fitness using a maximal treadmill test, lower maximal oxygen consumption (see Aerobic Fitness Section) was associated with metabolic syndrome [77]. Individuals with a normal weight can still be at risk for metabolic syndrome, often coinciding with an increasing waist size, inconsistent or low physical activity, excessive stress, and irregular or poor eating habits. Several consensus groups recommend weight loss in conjunction with physical activity as the cornerstone of treating metabolic syndrome [75]. A recent study found that a diet rich in whole grains promoted more abdominal fat loss than a diet with refined grains in obese adults with metabolic syndrome. Making positive lifestyle changes should be the first priority for individuals with metabolic syndrome and may reduce the need for medications [78].

Identification of metabolic Syndrome

Risk Factor	Defining Level
Abdominal Obesity: Men Women	Waist Circumference: ≥ 40 inches ≥ 35 inches
Triglyceride Levels	≥ 150 mg/dL
HDL Levels: Men Women	 < 40 mg/dL < 50 mg/dL
Blood Pressure	≥ 130/85 mm Hg
Fasting Glucose	≥ 100 mg/dL

To manage signs and symptoms of the metabolic syndrome, APFRI recommends:

- Focus foremost on the abdominal fat stores located underneath the abdominal muscle rather than the subcutaneous fat stored at the hips, waist (i.e. "love handles"), or shoulder area.
- Controlled weight loss of no greater than 1 to 2 pounds per week for a total reduction of 7-10% from baseline weight will target the abdominal fat stores since these cells are more metabolically active than subcutaneous fat cells.
- To combat insulin resistance (see page 14 for more information on insulin resistance), perform regular moderate-intensity physical activity, at least 30 minutes of continuous or intermittent exercise, on 5 or more days per week. Also limit the intake of concentrated sweets, particularly foods and beverages with high fructose corn syrup.
- To limit formation of arterial plaque, reduce the intake of saturated fat, trans fat, and cholesterol while also increasing the intake of fish and monounsaturated fats such as olives, avocados, and peanuts or oils made from those plant, often referred to as the Mediterranean style diet.
- Schedule regular screening if at risk for metabolic syndrome and follow up with primary care provider if blood pressure, cholesterol, or glucose is elevated.
- Get enough rest and sleep. If chronically tired in the morning after a full night's sleep, discuss possibility of sleep apnea with the primary care provider [79,80].

Physical Fitness

Flexibility

"Over the span of working life, adults lose some 8-10 cm of lower back and hip flexibility, as measured by the sit-and-reach test. The restriction in the range of movement at the major joints becomes yet more pronounced during retirement, and eventually, independence is threatened...." Roy J. Shephard, Faculty of Medicine, University of Toronto.

APFRI measures the flexibility of the lower back, hips, and hamstrings utilizing the sit-and-reach test. Your sit-and-reach score is considered a baseline flexibility measure. Each individual's score is compared to American College of Sports Medicine (ACSM) normative data [41] and a percentile ranking is determined taking your age and gender into account. APFRI also provides normative data for past assessments, so participants can see how their flexibility compares to that of prior participants of their age and gender.

Why is it important to improve and/or maintain flexibility? The average person slowly loses flexibility around their major joints due to aging, inactivity, poor posture, and muscle imbalance. This decline is partially due to degeneration of collagen fibers, found in muscle and connective tissue, as well as deterioration of joint structures. These decreases in flexibility typically begin in the third decade of life and become progressively more apparent to the individual in the fourth and fifth decades of life. These changes are often subtle. Early signs may include greater difficulty getting up and down from the floor, a reduction in power or effectiveness of one's golf swing resulting from decreased trunk rotation, and increased difficulty maintaining balance. Eventually, gradual loss of flexibility begins to impair your ability to remain active and we know that remaining active is vital for maintaining good health and fitness. If losses in flexibility go unchecked, a person may eventually have difficulty with basic daily activities such as putting on shoes and socks or picking something up off the floor. However, the good news is that muscle and connective tissue respond very well to stretching if it is done consistently and correctly. Maintaining flexibility and preventing the functional losses associated with inadequate flexibility is a readily attainable goal for those willing to invest just a little time and effort.

Recommendations: APFRI emphasizes flexibility as a key component of fitness in the over-40 population. For long-term gains in flexibility, we recommend a program of regular stretching as per the ACSM guidelines listed below. Stretching is most effective after a warm-up activity of at least 5-10 minutes in duration such as walking, slow jogging, or low intensity calisthenics. One effective strategy is to incorporate stretching as part of a cool-down activity after an exercise session.

Strength

Muscular strength is a fundamental physical trait necessary for health, functional ability, enhanced quality of life, and increased performance at work and athletic events. When one begins to examine how components of fitness affect one another, there is little doubt that those who perform both strength and aerobic training have higher cardio respiratory fitness than those who only perform aerobic training. Strength training is an essential component of any comprehensive exercise program and has additional benefits beyond simply increasing muscle strength. A consistent strength training program has been shown to improve bone mineral density, increase glucose tolerance and improve body composition by increasing lean muscle mass. Strength training also increases the strength of ligaments and tendons as well as maintains the joints' functional range of motion. Strength training allows you to perform more work without tiring, improves your ability to do everyday activities, prevents injuries, and speeds rehabilitation when an injury does occur.

Muscle tissue develops a "fatty marbling" within the fibers, very similar to a T-bone steak, if they are not stimulated through consistent strength training. This fatty marbling results in loose, weak muscle tissue and decreased overall strength. Strength training minimizes the "fatty marbling" within the muscle by tightening, shaping, and increasing muscle fiber size. Strength training increases lean muscle mass and resting metabolic rate (fat burning capacity). As you will note from the graph on the next page, we begin to lose muscle mass as early as the late thirties if nothing is done to prevent or minimize the aging effect. A loss of muscle strength is directly related to a loss of muscle mass. Muscle mass loss is primarily due to a decrease in the size and number of muscle fibers. Strength training helps maintain the number of muscle fibers as well as increases the size of existing fibers.

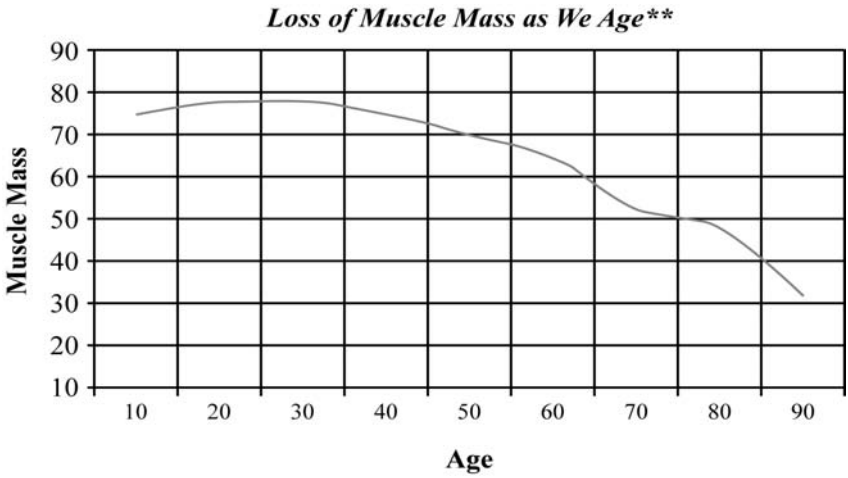
APFRI data from previous years demonstrate that senior leaders who engage in both strength and aerobic exercise have significantly less body fat than those who do not perform regular exercise. Strength training combined with consistent aerobic exercise and a sensible diet will help change your body composition and will decrease your risk for cardiovascular disease.

A common misconception amongst avid runners is that muscle gained through strength training adversely affects performance. Many runners believe that the additional weight from increased muscle mass will decrease running economy. However, it has been documented that strength training can actually improve run time by increasing running economy [81]. Total body strength training allows a runner to improve overall power and running economy and provides dynamic stability to the joints. Therefore, strength training is recommended for those who utilize running as their primary mode of aerobic exercise.

Another common misconception is that women think they will become big and bulky if they engage in strength training. The fact is that women have smaller muscle fibers and those fibers are not able to develop to the same size as men's muscle fibers. Strength training is extremely important for women, especially post-menopause. A woman's risk of developing osteoporosis and fractures increases with age. Strength training helps to minimize this risk by improving bone mineral reformation that increases bone density and strength [82,83]. Performing weight bearing activities and utilizing multi-joint strength training exercises helps to maximize the bone mineral reformation.

A common complaint about strength training and exercise routines is that strength gains or changes in appearance seem to level off. To avoid this, it is important to change what you do over time and continue to challenge your muscles and progress throughout your program. Changing exercises, number of repetitions (one complete movement of an

exercise), sets (group of repetitions), and frequency of exercise sessions are parameters that can be manipulated to see gains in a program. Regardless of your goals, an APFRI Health Fitness Specialist® can help you develop a plan to achieve your goals.



[**Adapted from McArtle, Katch, & Katch, Exercise Physiology, 4th ed., 1996]

The importance of strength training is further underscored by a statement that Dr. Steven Fleck, a world renowned strength expert, once made to a USAWC audience: "If you don't strength train, you will end up in a home!" His comments relate to the fact that the loss of muscle mass is directly related to quality of life and our ability to perform daily activities as we age.

Strength Testing. Your strength was determined using a series of three One Repetition Maximal (1RM) tests. The leg extension test measured the strength of your quadriceps muscles (located on the front of your thigh), the leg flexion test measured the strength of your hamstring muscles (located on the back of your thigh), and the bench press test measured the strength of your chest and shoulders.

APFRI data show a strong correlation between performances on leg extension, leg flexion, and bench press. Individuals who performed well on one measure of strength tended to score well on the others. APFRI data also show a strong correlation between performance on all measures of strength tested and aerobic fitness.

Leg flexion/leg extension ratio. The amount of weight lifted during leg flexion is divided by the weight lifted during leg extension to obtain a ratio between the hamstrings and quadriceps muscles. The accepted range of normal is between 65% and 100% (0.65 and 1.00) hamstring versus quadriceps. A good balance of strength between these two opposing muscle groups provides support to the knee joint and decreases the stress on underlying bony structures. It is possible for an individual to have a good leg flexion/ leg extension ration but have quadriceps and hamstring that are equally weak. Using physical therapy rehabilitation recommendations as a guideline, men should be able to lift approximately 100% of their body weight with the quadriceps muscles during the 1 RM leg extension test. Women should be able to lift approximately 70% of their body weight. Therefore, if the weight you lifted is lower than the established guidelines, strength training

is recommended to improve your lower body strength, regardless of whether or not you had good leg flexion/extension ratio.

Bench Press. Upper body strength is a good indicator of overall body strength. Men ages 50-59 should be able to lift 90% of their body weight, men ages 40-49 should be able to lift 100% of their body weight and men ages 30-39 should be able to lift 112% of their body weight. Women ages 50-59 should be able to lift 55% of their body weight, women ages 40-49 should be able to lift 62% of their body weight and women ages 30-39 should be able to lift 70% of their body weight [34]. Senior military leaders over the last 25 years show an increase of bench press-to-weight ratio. On average, today's male students can lift approximately 16% more than their body weight, compared to the 12% less than body weight that was lifted by students 20 years ago. In addition, male students who can bench press more than their own body weight have significantly lower percent body fat than male students who cannot bench press their own body weight. Increases in strength are correlated with increases of lean muscle mass, further explaining why Body Mass Index (BMI) is not a good measure for someone who has a low percent body fat due to increased muscle mass.

In summary, maintaining a strength training program will elicit great benefits, but must be performed consistently throughout your lifetime. The maintenance of lean muscle mass, in conjunction with aerobic exercise, contributes to a higher metabolism and increases your fat burning capacity. Additional benefits of strength training are improved flexibility, balance, and self-image. By doing so, you can age gracefully and maintain a great functional capacity long after you retire, allowing you to enjoy a higher quality of life.

Aerobic Fitness

Maximal Oxygen Uptake (VO_{2max} ml/kg/min). Maximal oxygen uptake (VO_{2max}), also known as "aerobic power" or "aerobic capacity", is accepted by the ACSM as the criterion measure to assess cardio-respiratory (heart-lungs) fitness [41]. VO_{2max} is related to the potential an individual has to perform long duration activities such as running, swimming and cycling. It is the maximal rate at which an individual can consume and utilize oxygen during exercise conditions. VO_{2max} is normally expressed in milliliters of oxygen per kilogram of body weight per minute of exercise (VO_{2max} ml/kg/min). This is called a "relative value" because it is specific to one's body weight. The higher the VO_{2max} ml/kg/min value the more aerobically fit the individual. For our population, a VO_{2max} value of > 49.0 ml/kg/min for men and > 40.0 ml/kg/min for women indicates a high level of aerobic fitness.

Tests designed to assess an individual's VO_{2max} measures the efficiency of the heart and lungs as they work together to supply oxygen and nutrients to working muscles. They measure the blood's ability to pick up oxygen and deliver the oxygen to the working muscles and the capacity of the muscles to take up the oxygen to produce energy. VO_{2max} testing is typically conducted on treadmills or cycle ergometers and may include the collection of respiratory gases (inhalation and exhalation). The respiratory gases are collected through a metabolic device that measures oxygen uptake and carbon dioxide production. This collection of expiratory gases allows APFRI exercise physiologists to determine when oxygen uptake has leveled off and increased carbon dioxide (CO^2) production begins. This indicates a shift toward anaerobic metabolism, the onset of fatigue and eventual maximal effort.

One physiological parameter directly affected by your effort during aerobic testing is the blood pressure response to the incremental increase in workload. As a result of increased workload during exercise, the systolic blood pressure (SBP), or working phase of the cardiac cycle, should rise with increased intensity of exercise. As the heart works harder to deliver blood, oxygen, and nutrients to the working muscles, the SBP will rise, indicating a higher blood volume coursing through the cardiovascular system. The diastolic blood pressure (DBP) is the resting phase of the cardiac cycle where the heart is filling with blood to send it out again with the next beat. In maximal exercise conditions, the DBP may raise slightly, then either level off or lower slightly in response to increased workload as an individual approaches maximal exercise conditions. These same responses are generally seen during submaximal tests as well.

For assessments, APFRI exercise physiologists will use a submaximal treadmill or cycle ergometer test to estimate VO_{2max}. A submaximal test provides an estimate of VO_{2max} when a positive linear relationship exists between heart rate and workload, and a steady state heart rate response is established within each stage of the test. Steady state is defined as a leveling off of a physiological function. In this case, the function is heart rate response to a specific workload.

Additionally, various submaximal measures such as blood pressure, heart rate and workload provide valuable information regarding an individual's response to exercise. These measures are affected slightly depending on the protocol or testing procedure used to determine an estimated VO_{2max}. The optimal mode of assessment should mimic the activity in which the participant trains on a regular basis. Specific adaptations of active individuals to the demands of exercise will have an impact on the heart rate response. For example, if a person generally runs as a chosen mode of exercise, and then performs a cycle ergometer assessment, the heart rate response may not be representative of the individual's true capacity. Additionally, the more self-propelled the motion is (running vs. cycling), the body will elicit a greater heart rate response due to overcoming ground reactive forces, motion of the arms, and energy requirements.

As a result of an individual's response to the mode of assessment, fatigue may occur in local muscle groups prior to reaching a true maximal, or required submaximal, effort. During a cycle ergometer assessment, fatigue may occur in the thigh, or during a treadmill assessment with incline, fatigue may occur in the calf or lower back. This fatigue may be felt as a "tightening" or "burning" sensation, which may be a result of current fitness levels, hydration status, or metabolic by-products which force an individual to slow down or stop an aerobic fitness test.

Aerobic Conditioning. Aerobic exercise is any form of sustained, rhythmical activity that increases heart rate to at least 65-70% of heart rate maximal (HRmax) and uses the major muscle groups of the body. The most common modes of aerobic exercise are running, jogging, swimming, cycling, or walking. Activities like tennis, walking the dog (unless the dog is trained to sustain movement), volleyball, or softball/baseball are not considered aerobic exercise by definition, but are beneficial for cross training and burning calories. The importance of consistent aerobic exercise cannot be emphasized enough, as it relates to both the effects of aging and disease prevention. Low VO2max is associated with increased mortality. The benefits of consistent aerobic exercise are numerous and well founded. The benefits include lower resting heart rate, lower blood pressure, lower heart rate response to exercise, lower body fat percentages, higher HDL (good) cholesterol levels, the prevention of Type 2 diabetes and cardiovascular disease (CVD) and reduced risk of some types of cancer.

There is a difference between an exercise prescription for general health and wellness versus one for fitness. The low end of the recommended aerobic exercise ranges for frequency, intensity, and time will serve to meet general health and wellness requirements. Within the realm of fitness, a continuum of exercise prescription exists to increase aerobic power. The ability to sustain maximal efforts of aerobic power is limited by the foundational base, which is a combination of consistent workouts and weekly duration. Additionally, the incorporation of specific high-intensity intervals is necessary to increase aerobic power. The larger the aerobic base, the greater the amount of physical stress the body can tolerate. In turn, this allows sustainment of high OPTEMPO deployments, better performance on Physical Readiness Tests, and positive impact on overall health and wellness. As stated by the ACSM "additional health benefits can be gained through greater amounts of physical activity. People who can maintain a regular regimen of activity that is of longer duration or of more vigorous intensity are likely to derive greater benefit."[41]

While training or exercising with a goal of performance enhancement, it is necessary to perform specific durations across a wide range of heart rate (HR) parameters from resting to maximal values, which will correspond with the speed of a specific movement. If an individual runs at a slower pace, their heart rate will be slower. If an individual runs at a faster pace, their HR will be faster. Studies have shown that in order to perform aerobic movements such as running, cycling, and swimming at higher speeds, an individual must also train systematically at those velocities. For example, if a person desires to race a 10k run with an average of 6:30/mile, and they only train at 9:00/mile, it will be nearly impossible for that individual to sustain 6:30/mile for the entire 10k distance.

Therefore, while training with a goal of performance enhancement, practical application of various HR ranges to meet desired performance outcomes would entail the majority of training be completed at a low intensity (55-64% of HRmax). Additionally, add 1-2 days/week of moderate to high intensity (65-84% of HRmax, and 85-100% HRmax, respectively) exercise, and allow for sufficient recovery. It is crucial to remember that with higher velocities, or speeds associated with the anaerobic threshold and VO2max, the chance for injury does slightly increase. Control and stability of movement supersedes the need for speed. An additional safety factor is the increase in volume and weekly distance. Participants must show caution as to how much additional volume (minutes or distance), intensity, or frequency is added weekly. The "10% rule" is a general recommendation for healthy individuals to use when increasing total weekly volume. As fitness improves, the participant will only increase one aspect of training (duration/distance, intensity, or frequency) by 10%. For example, if a runner performs a weekly mileage of 20 miles per week, the following week would be 22 miles.

The possibilities for "how much" can be limitless, but the specific amount is determined entirely by successful recovery. As the saying goes "it is better to be 20% undertrained, than even 1% over-trained." Adequate recovery and rest are more important than "pushing through" discomfort or any type of pain. In order to physically endure the rigors of leadership, you must be optimally conditioned and fully recovered to perform at peak levels. This aspect is where "operational fitness" differs from "operational duties." While operational, the need to endure long work hours, physically challenging duties, and high amounts of stress are a reality of occupational needs, but not permanent phases of life. Operational fitness is a permanent phase of life. This requires a fitness foundation that may exceed even the most elite athlete; because while the elite athlete trains for single events or matches over the course of a season, they have little responsibility outside of competitions. However, the tactical athlete competes 24/7 while operational, and holds far

more responsibilities while performing duties. This operational need is only possible with a broad foundation of aerobic fitness.

Physical Fitness, Exercise, and Brain Health

Exercise benefits more than your heart and other muscles. Exercise protects your brain and literally might make you smarter. The positive relationship between cognitive functioning and exercise begins in childhood and continues into early adulthood [84,85] Adults who exercise enjoy improved attention and processing speed, executive functions (such as planning and organizing), and memory regardless of age [86]. Later in life, numerous studies observed that exercise might slow or even reverse some of the memory declines commonly observed in our golden years [87]. While the majority of studies emphasize aerobic exercise, one review of the literature observed that for aging adults the best effect was for those who combined strength training and aerobic exercise [88, 89]. This is yet another reason to incorporate strength training into your fitness routine.

Just as aging is associated with declines in lean muscle mass, aging is also often characterized by loss of gray matter in several regions of the brain. Just like preserving muscle, one key to preserving gray matter appears to be physical exercise [90]. It turns out that exercise impacts more than a leader's observable mental performance; it actually leads to measurable physiological changes in the brain. For years scientists thought that adult brains did not generate new brain cells. That thinking is changing with the release of several exciting studies over the past few years showing that aerobic exercise can spark the production of new brain cells [91]. Of note, exercise preserves or increases volume in the hippocampus, an area of the brain especially important for learning and memory [91]. Therefore it is no surprise that aging people who are more aerobically fit both have larger hippocampuses and perform better on some memory test [92].

The hippocampus is not the only part of the brain to benefit from exercise. The brain's frontal lobes mediate "Executive functions" such as planning and organizing. Aging people who exercise have more brain volume in these regions than their sedentary counterparts and those who don't, even those who spend an equivalent amount of time stretching [93]. It is becoming clear that exercise can help stave off or even reverse some of the cognitive declines that were once considered an unavoidable part of getting older [94].

Guidelines for Aerobic Exercise*

For this population, APFRI recommends establishing a safe and effective aerobic exercise program using these parameters. If beginning a program, start at the low end of each parameter, slowly progressing to the upper end of the ranges within each parameter.

- Frequency: 5-6 days a week for optimal aerobic fitness, 3-4 days a week for aerobic fitness maintenance
- Intensity: 70-85% of Maximal Heart Rate (HR_{max})
- Time: 30 – 60 minutes
- Progression: Increase and/or vary frequency, intensity and time, once your body adapts, to continue to make fitness gains.

Training Heart Rate: One method of setting a target HR range is to use a straight percentage of your HR_{max}. HR_{max} is the maximal number of times your heart will beat under maximal exercise conditions, usually determined by a maximal effort treadmill test. To provide sufficient stimulus needed to improve or maintain VO_{2max}, a training heart rate range of 70-85% is required. Simply multiply the HR_{max} value once by 0.70 and again by 0.85 to calculate your aerobic target HR range.

Example: **Individual HR_{max} = 180 bpm**
180 x 0.70 = 126 bpm
180 x 0.85 = 153 bpm

Target HR Range = 126 – 153 beats per minute

If a HR_{max} is not available, you can determine your target HR range from an *estimated* HR_{max} (220 – age). This percent range is 70-85% of your estimated HR_{max}.

Example: **Individual age = 43 years**
220 – 43 = 177 bpm
177 x 0.70 = 124 bpm
177 x 0.85 = 150 bpm

Target HR Range = 124 – 150 beats per minute

Both methods may be used to approximate the range of exercise intensities known to improve or maintain VO_{2max}. It is important to remember that the second method is an **estimate and can vary by +/- 10-15 beats per minute**. If you have any questions about your Target HR Range, please consult the APFRI staff.

*Adapted from ACSM's Guidelines for Exercise Testing and Prescription, 8th ed [30]

Additional Assessment Surveys and Tests

General Exercise Profile

The exercise profile compiles the information that you entered on the General Exercise Survey prior to your APFRI health and wellness assessment. The profile focuses on the three main areas of a comprehensive exercise program: aerobic activity, strength training, and flexibility. The exercise profile can be used as a tool to gauge whether or not you are performing an adequate amount of activity in the various components of fitness. The exercise profile sheet also includes general exercise guidelines and recommendations for aerobic activity, strength training, and flexibility.

Exercise Profile: The Aerobic Exercise portion of the profile compiles the type of aerobic exercise you perform, number of sessions per week, and duration of each session. The profile requires a distinction be made between what constitutes moderate and vigorous levels of exercise. When expressed in terms of HR response to exercise, a low intensity level of exercise is between 55-64% of HR_{max}, moderate intensity exercise is between 65-74% of HR_{max}, and high intensity exercise is between 85-100% of HR_{max}. Exercise intensity may also be expressed in terms of a Metabolic Equivalent (MET). One MET is equivalent to approximately 3.5 ml/kg/min and reflects what the body expends at rest. Moderate intensity is approximately 3-6 METS and vigorous is 7 to 12 METS, or greater. This objective measure of intensity is usually displayed on common pieces of aerobic equipment seen in fitness centers. See the list of common forms of exercise particular to this population and the associated MET levels. Note that performing walking, jogging or running outside may increase their respective MET levels slightly due to wind resistance and the type of surface area.

Specific Exercise	METS
Weight Lifting, Beginner Workout	3.0
Stationary Rowing, 50 watts	3.5
Walking, 4.0 mph	5.0
Jogging, 6 mph	7.0
Stationary Rowing, 150 watts	8.5
Jumping Rope, Moderate	10.0
Running, 8.6 mph (7 min/mile)	14.0

Here is a quick equation to determine how many calories you are burning using METS and body weight:

Kcal / min = (METS x 3.5 x body weight in kg) / 200

Example: a 180 pound student exercising at 8 METS would burn 11.45 kcal / min

How does this relate to increasing aerobic power and becoming more aerobically fit? If an individual runs three times per week for 30 minutes and covers three miles or less, this may be considered moderate exercise, especially if this level of activity has been performed for a long time without any changes to the intensity, frequency or duration. If, however, the individual runs four to five times per week for 40 minutes and covers five miles or more during each run, then this is vigorous exercise. If your weekly aerobic exercise program is insufficient to produce improved aerobic fitness, the treadmill test will not only reveal this, but it will also alert APFRI staff to your need for intervention. Additionally, the total number of minutes each week reveals whether a sufficient amount of aerobic exercise is being performed for both health and fitness. For optimal fitness, some form of aerobic exercise alternating between hard and easy workouts, as determined by HR response, must be performed on most days of the week.

Strength Training: Strength training is an essential component of any comprehensive exercise program. The strength training portion of the profile focuses on the type of strength training activity, sessions per week, duration of each session, number of sets and repetitions that you perform on a weekly basis. You should compare the strength training activity that you report with the recommendations provided in this section to assess whether you need to modify your current strength training program.

Flexibility: Flexibility is an important component of an exercise program that is often overlooked or avoided. The flexibility portion of the exercise profile compiles the number of sessions per week, duration of each session, amount of time the stretch is held and the number of repetitions for each stretch, as well as when the flexibility portion of the exercise program is performed. You should compare the flexibility exercises that you report with the recommendations provided in this section to assess whether you need to modify your current flexibility training program. Flexibility exercises must be performed to maintain proper range of motion in your joints. This becomes increasingly important as you age.

Recent Injury: The exercise profile sheet will also capture whether you have reported a recent injury or not. If a recent injury is reported, your name is forwarded to APFRI's Executive Fitness Program staff for a consultation or follow-up.

Nutrition Survey Profile

The nutrition profile compiles the information that you entered on the Nutrition Survey prior to your APFRI health and wellness assessment. The profile focuses on your average intake of the different food groups over a one week period and your current meal habits. The nutrition profile can be used as a tool to gauge whether or not you are eating an adequate diet from the various food groups. The nutrition profile sheet also includes nutrition guidelines based on a 2000-calorie reference diet and recommendations for eating healthier.

Food Group: The Food Group portion of the profile compiles the foods you eat and drink based on days/week, portions/day, and portions/week. Your total weekly intake from each food group is calculated and then compared to a 2000-calorie reference diet. You may need more or less calories to meet your nutritional and overall health goals. The Bod Pod feedback form will recommend your caloric requirement for various activity levels based on your calculated lean mass. Men require at least 1500 calories daily, where women need 1200 calories, just to meet basic health needs at complete rest. If you have a negative difference in the food group, you may need to consider increasing your intake of that specific food group to balance your overall diet.

Meal Habits: The Meal Habits portion of the profile focuses on your intake of breakfast, snacks, restaurant meals, fast food and use of salt on a weekly basis. Breakfast is an important component of your diet. The preponderance of data suggests that eating breakfast is important to losing weight and maintaining weight loss. No matter how busy they are, all leaders should eat breakfast for optimal performance. Studies show that people's memory improves when they have had breakfast [95]. Therefore breakfast will not only boost the leader's metabolism and help keep the weight off, but it will also make the leader feel smarter throughout the day.

How much and what is eaten at breakfast may also be a contributing factor. Eating three or more "small meals" per day will help to prevent insulin spikes (see section on Glucose). This will help avoid excessive hunger at the dinner meal or evening snack. Athletes who eat four or more meals throughout the day are more successful in building lean mass and reducing fat mass than athletes who eat three or fewer meals per day. The energy consumed at a single meal is preferably stored in the muscle tissue or liver to sustain activity for the next 3-5 hours. Eating two or fewer larger meals can lead to higher energy intake at those meals than what the body can practically store in the muscle and liver tissue and hence leads to fat production and long term storage. Reversely, skipping meals will result in breakdown of muscle stores for energy rather than utilization of fat stores.

The use of snacks can enhance those areas in your diet that are currently deficient. Plan ahead for high fiber and nutrient- dense snacks for the parts of the day when energy usually runs low. If eating away from home is part of your daily routine, choose restaurants and snack-bars that offer healthy choices and keep a close eye on portion sizes. Save the less healthy menu choices for birthdays and anniversary celebrations and make responsible heart healthy decisions for your daily meals away from home. Most restaurants will have a menu with nutrition analysis on their website or look for the healthy heart logo on the menu. Strategically planning ahead for frequently visited restaurants will prevent impulse decisions and unhealthy selections when restraint is severely weakened by hunger.

Portion Distortion (Nutrition Table)

The purpose of the nutrition table is to measure when you eat as well as your average daily food and beverage intake using three-dimensional food models. The food models displayed on the nutrition table reflect appropriate portion sizes based on the MyPlate website **(http://www.myPlate.gov)** and 2010 Dietary Guidelines for Americans [27]. People often underestimate their intake and the use of food models may assist with a better assessment of your nutritional intake. The food table allows the registered dietitian and out-briefers to explain your results based on the food categories as well as distribution of meals and snacks compared to a 1600-2600 calorie diet. It is best to spread your calories throughout the day. Consuming all of your calories at dinner and later can lead to unwanted weight gain and poor health. To have a better understanding of what the portion sizes really are, you may need to measure your foods with measuring cups and spoons for a few days; it is helpful to have a visual image of your favorite foods in the appropriate portions on your plate.

As part of your assessment, you received a "Nutritional Tips to Improve Your Health" handout. Additional suggestions are available within this resource.

Preventive Measures for Good Health

Dietary Intake. Consuming fruits, vegetables, whole grains, low-fat milk products, and lean protein sources improves the nutrient density of your diet. Poor diet has been linked with many causes of death to include coronary heart disease, hypertension, diabetes, osteoporosis, renal disease, and certain cancers [96]. Long-term consumption of red (beef, pork, lamb) and processed meats also may increase the risk of heart disease, colon and stomach cancer [97, 98] and diabetes. The American Institute of Cancer Research recommends consuming no more than 18 ounces of cooked red meat per week and limiting processed meat (bacon, sausage, etc.) to special occasions. The 2010 Dietary Guidelines for Americans indentifies solid fats and added sugars as major health concerns. Solid fats contribute an average of 19% and added sugars about 16% of the total calories in American diets, but few essential nutrients and no dietary fiber. Significant sources of solid fats in the American diet are grain-based desserts (11% of all solid fat intake); pizza (9%); regular (full-fat) cheese (8%); sausage, franks, bacon, and ribs (7%); and fried white potatoes (5%) [99].

A high fat diet not only will make a leader feel worse, it will adversely impact that leader's thinking. After just one week of a high-fat diet, sedentary men in their late 30's had measurably slower reaction times and poorer attention. They also felt less calm and less alert. Leaders who value being alert, thinking quickly, and remaining calm may wish to avoid a high fat diet [99].

The recommendations of the "Food Guide Plate" include making half of your grains whole grains, varying your vegetables, focusing on fruits, selecting calcium rich foods, eating lean protein sources, finding a balance between food and physical activity, and knowing your limits on solid fats, added sugars, and salt. Please see the link for the new dietary guidelines on the APFRI website for many insightful techniques to improve your overall health through your diet: **https://apfri.carlisle.army.mil/web/education/links.cfm.**

Bone Health. Consume 1000-1200 mg of calcium daily to help prevent osteoporosis. One 8-ounce serving of low fat or fat free milk or yogurt has about 300 mg of calcium. Consider supplements if you cannot consume enough calcium through food. Your body can only absorb approximately 500 mg of calcium at a time. If you take a supplement take only 500 mg at a time and consume with non-dairy food sources. On the food label, calcium content is stated as a percent of calcium's daily value, which is 1000 mg/day. If the label states that a food provides 20% of the daily value for calcium, then one serving contains approximately 200 mg of calcium (1000 X 20%). In addition to the calcium, obtain 600IU-800IU of vitamin D daily. Without sufficient Vitamin D, calcium absorption cannot be maximized. This amount can be obtained with a supplement of 400IU along with 15-20 minutes of exposure to sunlight each day. Fortified foods provide most of the vitamin D in the American diet. For example, almost all of the U.S. milk supply is fortified with 100IU vitamin D per cup (17% of the Daily Value). Another excellent source of vitamin D is fatty fish.

Heart Health. Depending on your risk factors for heart disease, you may want to consider one or more of the following after consultation with your primary healthcare provider: Aspirin: 81 mg/day, supplemental fish oil: 2-4 g/day, plant stanols/sterols: 2 g/day [45]. When selecting a supplemental fish oil product, look for one that is distilled and provides at least 50% of the weight as EPA (Eicosapentaenoic acid) or DHA (Docosahexaenoic acid) [74]. A product that is entericly coated will help to prevent indigestion from the fish

oil capsules. As always, it is best to get your vitamins and minerals from food first, since they often contain many other micronutrients, vitamins and minerals that work together to increase absorption.

For leaders of all ages who are women, B vitamins and folate have positive effects on memory [100]. Younger women with iron deficiency have cognitive deficits reversed with iron treatment [101]. It makes sense for women to ensure they are getting enough of these nutrients in their diet and to consult a dietician if they have concerns.

Please Note: Aspirin has been shown to decrease the risk of stroke and may also decrease the risk for coronary heart disease because of its ability to decrease blood clotting. Aspirin is a medication with significant side effects and should only be prescribed if potential benefits outweigh the risks. Because individual circumstances may vary, consult your primary healthcare provider before starting aspirin or additional nutritional supplements.

Tobacco Use. Cigarette, pipe and cigar smoking greatly increase the risk of cardiopulmonary (heart/lung) disease. People who smoke also tends to rate their overall health from fair to poor . Smoking causes injury and inflammation in the lining of blood vessels [102]. Injury and inflammation cause the blood vessels to narrow which decreases blood flow to the heart muscle. In addition, inflammation promotes blood clot formation, which places an individual at greater risk for a heart attack and stroke. It is well established since the 1990's that even just one cigarette and low levels of nicotine cause the blood vessels to narrow [103]. Tobacco use of any kind, whether inhaled, non-inhaled, and/or smokeless, is strongly implicated as a cause of many, varied forms of cancer [104]. If you smoke, quitting will do more than reduce your risk of cancer, heart disease, and other serious illness. Quitting smoking in midlife reduces the risk of dementia later in your life. People who smoke heavily in midlife are at increased risk of developing Alzheimer's Disease and Vascular dementia. Those who quit smoking in midlife or smoked less than half a pack per day had similar risks to non-smokers [105,106].

There are options to stop using tobacco products. Research shows that combining medications for tobacco cessation and including ways to change behavior, either through, on-line programs, individual counseling, or a group setting, improves the rate of success with smoking cessation [107]. The Food and Drug Administration (FDA) has approved five products for smoking cessation, including nicotine gum; nicotine transdermal patch; nicotine nasal spray; nicotine inhaler; and a non-nicotine agent, sustained-release buproprion (Zyban) and varenicline (Chantix). However, in 2007 the FDA concluded that Chantix is associated with possible severe mood and behavior changes either during or following medication therapy, which may contraindicate the use of this medication. Ask your health care provider today about evidence-based options and reliable on-line resources to stop using tobacco products.

Alcohol Intake. Research supports that moderate ingestion of alcohol may decrease the risk of a coronary heart disease and diabetes by increasing the HDL and insulin sensitivity. Moderate alcohol use can decrease the risk for heart attack [108]. However, alcohol still may not change mortality related to CVD changes. Alcohol is considered a drug that can potentially be addictive, both physically and psychologically, can cause liver and stomach damage, and increase triglyceride levels [109]. Constant excessive drinking and binge drinking can lead to stroke, pancreatitis, several types of cancer, accidents, homicide, and suicide. A recent study found that even moderate alcohol use is associated with increased risk for breast and other cancers in women [110]. Due to differences between men and

women in the way alcohol is metabolized, the standards presented below for moderate alcohol use reflect this gender difference.

Consume alcohol in moderation:

- Men: < 2 drinks per day
- Women: < 1 drink per day.

- One drink = 1.5 oz hard liquor; 5 oz wine; or 12 oz beer. Each provides 100-150 calories. Alcohol has no nutritional value except calories.
- Research has shown that 1-2 drinks per day may increase HDL (good) cholesterol up to 12%, but more is not better.
- Alcohol has cardio-protective benefits as it inhibits blood clotting and improves insulin sensitivity. Individuals on anticoagulation medications or insulin therapy must carefully consider this effect of alcohol [108].
- A diet containing moderate alcohol and rich in dark green leafy vegetables like spinach and turnip greens, citrus fruits, and dried beans and peas, resulted in lower risk for cancer for women. If you notice that you are dependent on daily alcohol ingestion for physical or emotional symptoms, consult your healthcare provider immediately.

Benefits of Chocolate. Consuming small amounts of dark chocolate with at least 65% cocoa may help reduce the risk of cardiovascular disease by lowering blood pressure, reducing inflammation, inhibiting blood clotting, raising HDL cholesterol, decreasing oxidation of LDL cholesterol, and improving the function of the blood vessels' endothelium. Cocoa beans are rich in flavanols, but processing of the beans such as fermentation, alkalizing, and roasting reduces the flavanol content. Darker chocolate has more flavanols and 1 ounce per day appears to be cardioprotective. The good news is that the saturated fat found in chocolate (stearic acid) has a neutral effect on LDL cholesterol [111].

Vitamin D and Heart Disease. Low blood levels of vitamin D may not only affect your bone strength but also your risk for heart disease. A large population study found that those with low "normal" levels had greater risk (50%) to develop heart disease and 1 of 4 Americans may fall into this category. It is too early to tell whether the low vitamin D levels were a contributor towards risk or an indicator for risk. Regardless, a low vitamin D blood level has been linked to many auto-inflammatory diseases and weaker bone formation. One key to good health appears to be the maintenance of adequate vitamin D levels throughout life [112].

The Recommended Daily Allowance for vitamin D was recently increased for Americans to 600IU per day. Adults over age 70 should aim for 800IU [113]. This amount of vitamin D can readily be obtained through a diet including fatty fish, milk, cereal fortified with vitamin D, and egg yolk. Since egg yolk has many nutritional benefits, the consensus within the 2010 Dietary Guidelines for Americans is that one egg yolk per day can fit into a healthy diet, but eggs are still a major source of saturated fat and cholesterol so some caution is still in order [114].

Another approach to improving stored vitamin D is daily recreational activities or exercise during day light. Consider taking a 20 minute walk after lunch or plan daily activities to include a short period of outside activity during day light. With the help from ultraviolet-B light, the skin can form its own vitamin D. The ability to form vitamin D is, however, dependent on several factors including season, latitude, cloud cover, smog, skin

pigmentation, age, body composition, sunscreen use and genetic variations in the ability to transport the vitamin from the skin to the circulatory system [115]. It is also worth noting that insufficient ultraviolet-B photons reach the earth's surface during winter months affecting individuals residing at latitudes greater than 35° to 37° north or south [113]. For the United States, that translates to 2/3 of the nation, or north of Tennessee. These factors, coupled with the fact that higher levels of subcutaneous body fat can also interfere with vitamin D production in the skin, largely explains why one in four Americans are at risk for low vitamin D blood levels. APFRI's observational studies have identified that many senior leaders who spend majority of their day inside and have a diet with limited intake of milk or fish often have low vitamin D blood levels. Ask your health care provider to screen you for low vitamin D level if you likely fall into this category.

Nutrition Tips to Reduce High LDL Cholesterol Levels

Increase intake of dietary fiber. Dietary fiber can lower LDL cholesterol levels. Dietary fiber is found in whole grain cereals, breads, and crackers, and in fruits and vegetables. Soluble fiber such as oats, barley, legumes, rice bran, nuts, seeds, fruit, and vegetables may reduce your LDL cholesterol levels [45,98]. Slowly add more fiber to your diet over several days, if not weeks, while drinking more water. This will help reduce gastrointestinal discomfort as the gut adjusts to the higher fiber intake. To increase intake of dietary fiber:

- Choose whole grain breads, cereals, rice, and pasta.
- At least 50% of your grains should come from whole grain sources.
- Consume an adequate amount of fruits/vegetables per day.
- Increase intake of beans/legumes.
- Choose bread with at least 3 grams of fiber per slice.
- Choose high fiber breakfast cereals (e.g., oatmeal, Cheerios, Shredded Wheat, Fiber-One, Raisin Bran, etc.).
- Drink a glass of orange juice or eat vitamin C rich fruit (strawberries, cantaloupe, kiwi) with your oatmeal to help increase the effectiveness of the soluble fiber.

Limit intake of saturated fat. Saturated fat increases total cholesterol and LDL cholesterol levels. Sources of saturated fat include animal-based foods (meat, poultry, whole milk, and whole milk products) and tropical oils (coconut, palm, and palm kernel oils). Saturated fats are generally solid at room temperature. To limit intake of saturated fat:

- Choose meat and pork products with "round" or "loin" in the name: pork loin, tenderloin or ground round.
- Choose 90% lean ground beef/turkey or leaner.
- Choose low-fat dairy foods and limit intake of high fat dairy products: 1% or fat-free milk and low-fat or fat free yogurt, cheese, or ice cream instead of regular (full-fat) cheese, creamer, and half-and-half.

Reduce intake of trans or hydrogenated fatty acids. *Trans* fatty acids increase LDL cholesterol levels and decrease HDL cholesterol. Trans fatty acids are found in margarines, shortening, fast foods, and many packaged foods, particularly cookies and pastries. Intake should be as low as possible but no more than 1 gram per 1000 calories, which implies that most Americans should consume less than 3 grams trans fat per day [24]. Processed baked goods such as donuts and cookies are generally high in trans fats as are some foods many people would consider "healthy," such as popcorn. For example, if you consume half of an average bag of butter flavor microwave popcorn, you will be consuming at least 5 grams of trans fat. As of January 2006, food manufacturers must list the trans fatty acid content on nutrition fact labels; however, amounts < 0.5 gram per serving is not currently reported. Therefore, make a habit of reading the ingredient list below the nutrition facts to identify any "partially hydrogenated" oils, which indicates the presence of trans fat in small amounts. To limit intake of trans fatty acids:

- Use tub or liquid margarine instead of stick margarine; but note that most tub
  margarines still contain ~0.3 gram trans fat per tablespoon (one serving).
- Try some of the trans-free margarines, although they may still have trace amounts of trans fat.
- Reduce intake of fast food and commercially baked products such as crackers, cookies, chips, microwave popcorn and other snack foods.

Select monounsaturated fat in place of saturated fats or *trans* fatty acids.

Monounsaturated fat decreases LDL cholesterol and may increase HDL cholesterol. Monounsaturated fats are generally liquid at room temperature. It is important to substitute monounsaturated fats for fats currently consumed rather than simply adding them to your current diet since excess calories from fat can lead to weight gain. To improve intake of monounsaturated fats:

- Use canola or olive oil for cooking or salad dressings. Oils made from nuts and seeds, i.e. pecan and walnut oil are good sources of monounsaturated fatty acids but are best used for dressings and dips since the low smoke point makes them less suitable for cooking. Store your oils in the refrigerator once opened to prevent oxidation, a process which spoils the beneficial qualities of the oil.
- Enjoy small amounts of avocado slices or guacamole.
- Nuts (peanuts, walnuts, almonds, pecans, soy nuts, etc.) and nut butters are high in monounsaturated fat but also high in calories. Consume these foods in moderation.

Increase intake of omega-3 fatty acids. Omega-3 fatty acids decrease triglycerides and may decrease total cholesterol. Omega-3 fatty acids are found mostly in cold-water fish (mackerel, tuna, salmon, sardines, and lake trout). Several studies suggest that consuming fish slows or prevents some of the normal cognitive decline associated with aging. The mechanism is unclear, but many suspect this effect is due to n-3 polyunsaturated fatty acids in fish including EPA and DHA [116]. It should be observed that the link between cognition, EPA, and DHA is still under debate. However, it is still a good idea for leaders to include fish in their diet twice a week given the other less debatable positive effects this will have their health. Green leafy vegetables, flax seed, canola oil, soybeans, and walnuts are additional sources of omega-3 fatty acids. Nuts and seeds also contain an

alpha-linolenic acid, which is converted into omega-3 fatty acids in the body. In a recent study, individuals who ate one to two servings of fish per week were at lower risk of sudden cardiac death compared to those eating less than one serving of fish per month [43,101]. Research has concluded that the absolute amount of alpha-linolenic acid in the diet is of primary importance for preventing heart disease [117,118]. To increase intake of omega-3 fatty acids:

- Consume seafood two to three times per week.*
- Add nuts or seeds to your diet 4–5 times per week.
- Grill or bake white fish with lemon or lime juice and season with dill weed instead of frying.
- In the presence of heart disease, when regular consumption of fish is not possible, discuss supplemental fish oil of 2-4 grams per day with your primary care provider for the treatment of high triglyceride levels [44]. As a preventive measure, supplementation with 1 gram of fish oil per day would be equivalent to eating a 4 oz portion of fatty fish.

*Caution is urged for women who are pregnant or may become pregnant, nursing mothers, and young children due to mercury content in seafood that contains omega-3 fatty acids. According to the U.S. Environmental Protection Agency (EPA) and the U.S. Food and Drug Administration (FDA), these specific groups should not consume shark, swordfish, king mackerel, or tilefish due to the high mercury levels. Five of the most commonly eaten fish that are low in mercury are shrimp, canned light tuna, salmon, pollock, and catfish. Please see the APFRI website for links to the FDA's website for additional information about the risks of mercury in fish and shellfish and the EPA's website for information regarding the safety of fish and shellfish: ***https://apfri.carlisle.army.mil/web/education/links.cfm.***

Limit intake of sugar sources. Limit your intake of table sugar and foods with added sugar such as candy, cookies, and cakes. Added sugar may be hidden on the food label as high fructose corn syrup and can be found in sports drinks, soft drinks, fruit drinks, syrup, chewing gum, and salad dressings. Excessive sugar intake increases LDL cholesterol. According to the 2010 Dietary Guidelines for Americans, the major sources of added sugars in the diets of Americans are soda, energy drinks, and sports drinks (36% of added sugar intake), grain-based desserts (13%), sugar-sweetened fruit drinks(10%), dairy-based desserts (6%), and candy (6%) [21].

Reduce intake of dietary cholesterol. Intake of dietary cholesterol can increase total cholesterol levels. Cholesterol is only found in foods of animal origin. Limit intake of dietary cholesterol to less than 300 mg per day by:

- Limiting intake of meat and meat products to 5-6 oz per day.
- Limiting intake of liver and/or organ meats to no more than once every 3 months.
- Limiting intake of egg yolks to no more than 4 per week; egg whites or commercial egg substitutes or reduced-cholesterol egg products can replace whole eggs in many recipes. Note that egg yolks are not only high in cholesterol but also high in saturated fat.

Increase intake of dietary sources of plant stanols/sterols. Vegetables and plant sources of fat contain cholesterol-like molecules called stanols and sterols. These compounds appear to interfere with normal absorption and processing of animal sources

of cholesterol. Some high fat foods such as sunflower seeds, almonds, avocados, corn oil, and olive oil deliver a higher amount of plant sterols, but a robust intake of "non-fat" food sources like vegetables, fruits, whole grain, and legumes can also contribute to an overall significant intake of plant stanols and sterols. Several functional foods exist on the market today, such as yogurt, margarine and orange juice, which deliver one gram or more of plant stanols/sterols per serving. Amounts greater than two grams per day have not shown any additional benefits [24].

Nutrition Tips for Weight Loss

Weight gain is the result of an imbalance between energy intake and energy expenditure over an extended period of time. An extra 10 calories per day will lead to 1 pound weight gain each year. The American way-of-life facilitates excessive intake with its abundance of inexpensive, high calorie foods, numerous restaurants and fast-food locations promoting eating away from home, and excessive portion sizes [119]. To promote long-term weight maintenance, your program must consist of permanent dietary changes, physical activity, and behavior alterations [120].

Increase intake of fruit and vegetables. Most fruit and vegetables are high in fiber and low in calories. By substituting fruit and vegetables for higher fat foods you can decrease your calorie intake without decreasing the amount of food you eat. For example, instead of having four slices of pizza, try having two slices and a side salad. Unfortunately not all vegetables are created equal. Starchy vegetables, such as corn, potatoes, peas, beans, legumes, and winter squash (acorn and butternut) are higher in calories than other vegetables. Eating starchy vegetables is necessary to provide a variety of nutrients, but the portion sizes should be appropriate to limit extra calories and potential weight gain.

Eat breakfast and reduce the number of meals eaten away from home. Skipping breakfast or eating breakfast or dinner away from home could increase your risk of gaining weight. A study found that breakfast skippers had 4.5 times the risk of obesity compared to those eating breakfast regularly. This same study also suggested that eating breakfast or dinner away from home might increase the risk of obesity [119].

Be aware of the extra calories that come with larger portion sizes. A savings of 250 to 500 calories per day leads to a half a pound to a pound of weight loss per week. Switching to smaller size food items can help reduce caloric intake without removing foods from your diet. Some examples are provided below:

Small freezer size bagel vs. a deli size bagel = savings of 290 calories.
Small order of French-fries vs. large order = savings of 400 calories.

Be aware of fluid calories. Calories found in beverages can quickly add up and contribute to weight gain or failure to lose weight. One can (12 ounces) of regular soda has around 150 calories, whereas one 20 ounce bottle of regular soda contains 250 calories. The primary source of added sugar in the American diet comes from soft drinks and sugar-sweetened beverages. The American Heart Association in a 2009 Scientific Statement advised limiting added sugars to no more than 100 calories per day for women and no more than 150 calories per day for men as an attempt to affect the national health risks associated with obesity and excess weight. Juice and milk, although healthy for you, also quickly contribute extra calories to your diet. Limiting your intake of calorie-containing beverages and increasing your intake of calorie-free beverages will help you achieve and maintain a healthy weight. Alcohol has no nutritional value except calories. Also, be aware of the caloric content of sports drinks and protein shakes.

Keep a food and exercise/activity log. Keeping a food log can help you get a better idea about where your calories are coming from and if your diet is nutritionally adequate. Additionally keeping a food log may help you identify if you eat in response to stress. You can track your diet and exercise in a notebook, on your PDA, or on one of the many nutrition web sites available. Please see the APFRI website for additional nutrition and fitness resources: https://apfri.carlisle.army.mil/web/education/links.cfm

Weight Maintenance. After you lose weight, you have to maintain a lower calorie intake and/or higher activity level or you will regain weight [60]. The best way to lose weight and maintain weight loss is to make changes that you can maintain for a lifetime. Although weight fluctuations of 3-5 pounds are fairly common, a consistent tightness in clothes or loosening your belt are indicators of increased abdominal fat and are signs that you need to reevaluate your eating and exercise habits.

Nutritional Supplements. Eating a wide variety of foods provides the essential nutrients to promote optimal health and reduce your risk for disease. Although nutritional supplements should never be used as a substitute for healthful eating, a general multivitamin and mineral supplement providing no more than 100% of the RDA for each nutrient is safe and potentially beneficial for some individuals. If your diet is well balanced with nutrient-dense foods, you may choose to take your multivitamin and mineral supplement every other day to complement an already healthy diet. (See Preventive Measures for Good Health section for additional information)

Building Resiliency and Managing Stress

The benefits of psychological resiliency (or bouncing back in the face of adversity) have been well known for decades, and over the past several years the Army has developed Comprehensive Soldier Fitness (CSF) to enhance resiliency in the force. This program focuses on developing resiliency by focusing on fitness in through physical, emotional, family, social and spiritual domains. These areas also have a strong relationship to Physical, Cognitive, and Moral Human Dimensions of leader development. As a senior leader, your personal resilience as well as facilitating resiliency in your unit and staff is essential for optimal performance, especially given current operational tempo internationally. APFRI has taken these key concepts and tailored them to the senior leader to enhance your performance and professional development. The APFRI Comprehensive Assessment provides screening measures for your own personal assessment of six important areas of psychosocial variables that are related to your overall psychological well-being, resiliency, and cardiovascular health, which are all directly related to your effectiveness as a leader: depression, anxiety, anger, and type-A behavior, sleep disturbance, and combat stress. Research has demonstrated a convincing linkage between the development of these areas and unmanaged stress. This guide lists several techniques for managing stress. This is an important skill for leaders because memory, attention, and decision-making are all strongly impacted by unmanaged stress. For optimal performance, leaders must practice effective techniques that help keep their stress under control. By first increasing awareness of your personal resilience, you may find domains or dimensions in your life that you wish to dedicate more energy or effort to enhance your performance as a senior leader.

Exercising the Mind for Mental Agility. If physical exercise is good for the leader's brain, how about mental exercise? What kinds of mental activities might improve your thinking? Although for years it was assumed that mental exercises can't increase

intelligence and any improvements on tests were simply the result of practice. However, one mental exercise, the "dual n-back," is very promising and appears to produce increases in fluid intelligence, or the ability to adapt thinking to solve new problems. These gains transfer to other tasks, not just improvements that can be chalked up to practice [121]. Those interested in practicing the dual n-back can find several online versions through an internet search. Scientists are also finding physical changes in the brain that correlate with practicing tasks similar to the dual n-back [122].

Another mental exercise proven to have an impact is "mindfulness" training or mindfulness meditation. Mindfulness training can reduce anxiety and increase an overall feeling of well-being, but more interesting is that with just eight weeks of practice changes in the brain become evident on a MRI [123].

According to a special report on memory released by Johns Hopkins, engaging in mentally challenging activities will help build a cognitive reserve that slows the onset of memory loss. The report recommends activities such as games, puzzles, cooking, playing music, taking classes, and home improvement. Almost as important, the report emphasizes that watching TV is a passive activity that does not stimulate your mind. As a result those who watch TV are more prone to dementia than those who avoid it [124].

Chronic stress can begin to not only deplete your emotional resources, but also negatively impact you physiologically as well. When you feel unable to cope with a situation or stressor, your body becomes energized to meet this perceived demand, responding with a physical stress response composed of hormones that temporarily boost your ability to respond. However, over the long-term, the "short-term" responses to demands can take a heavy toll on your mind and body. Adrenaline is one of the first hormones released and you will quickly realize its effect with the increased heart rate and respiration as your body prepares its response to the stressor. This also causes your blood sugar to rise (which is why chronic stress can lead to Type 2 diabetes). Blood is also being diverted to your brain and large muscle groups as your body somewhat mindlessly prepares for the perceived "danger." If you stay activated in this "stress" mode for too long, your body attempts to restore balance by sending the hormone cortisol to help regulate the higher level of stress response. However, prolonged cortisol activation (resulting from chronic stress situations) has many negative side-effects, including increased abdominal fat or "belt size," one of APFRI's most consistent predictors of abnormal heart scan results. Some indicators of impacted resiliency and too much stress include feeling irritable or edgy, chronic muscle tension, feeling "keyed up", trouble sleeping (either feeling sleepy or trouble sleeping through the night, both of which are often due to increased cortisol levels), eating too much (eating carbohydrates increases serotonin levels; serotonin is the neurotransmitter that is increased by many antidepressants), loss of appetite,frequent colds (too much stress can suppress your immune system, making you more susceptible to illness) or rapid heartbeats and possibly even irregular heart rhythms (i.e., arrhythmias).

Relieving Stress

If you have identified indicators that you are experiencing too much stress or that your resiliency is not as strong as you would like, consider attending an APFRI class, consulting with an APFRI clinical psychologist or trying the following strategies.

1. Exercise. As a senior leader, you set the example for overall health and fitness so get moving! Research convincingly demonstrates that regular exercise will reduce stress, depression, and anxiety (all key risk factors for cardiovascular disease). Regular exercise causes the body to release "endorphins," substances that are known to produce feelings of satisfaction and wellness. One way it does this is by loosening your muscles and relieving emotional intensity. It also provides you a sense of mastery and achievement over the normal stresses of the day and for some, a sense of effectiveness in controlling the aging process. Additionally, recent research from the Millennium Cohort Study has found that physical activity even mitigates both new onset and persistent post traumatic stress symptoms in military personnel [125]. Research summarily suggests that physical fitness can help reduce depression and anxiety symptoms [126], which makes physical fitness a cornerstone of enhanced resiliency and overall well-being.

2. Positive emotion and optimism. Just as negative emotion can be a health risk, positive emotion, such as happiness, can have favorable benefits for your health and your life. One recent review of the literature concluded that happiness is a factor in bringing about success in life and is not just a product of success. The research shows that happiness leads to success, health, fulfilling relationships, and longevity [127]. You can enjoy an increase in happiness from following the proverb "count your blessings" or "hunting the good stuff" everyday. Positive Psychology and resiliency researchers have found that the simple act of writing down, or sharing with another person, five things every day for which you are grateful can increase feelings of well-being and decrease feelings of depression [128]. Another aspect to build positive emotion is to focus on controllable factors, as there are aspects in life that we will not be able to fully control, especially as leaders. By placing our resources into aspects we can influence or control, we can facilitate positive emotion and build optimism. Colin Powell fully embraced this concept as his Rule #7 states "You can't make someone else's decisions, you shouldn't let someone else make yours". Your health and diet can also be an important contributor to greater well-being in life, as research supports the correlation between healthy nutrition discussed at length earlier in this guide and preventing (but not as treatment for) depressive symptoms [129].

3. Get plenty of rest. As a senior leader, getting enough sleep is essential to your optimal performance, and will improve your attitude, concentration, health and longevity, as well as provide you energy to exercise,. Please refer to the following section on Improving Sleep Quality for specific tips to improve sleep. Moveover, give yourself permission to take a break. If your goal is to always see how much more you can achieve, paradoxically, taking brief breaks will actually provide you more concentration and stamina than if you try to continually push yourself. Field Marshall Slim provides a great account of how this relates to a senior leader in combat in his book, *Defeat Into Victory.*

4. Simplify your life and get organized. Prioritize, plan, and pace yourself so you are primed for success – as a leader these aspects are essential for your success and you've likely mastered occupationally related aspects. However, as you continually increase your responsibilities determine your "true" priorities and then appropriately delegate to others, accepting that you do not have, nor likely are able to do it all. For example, prioritize time for important areas of your life and dedicate time accordingly. See the subheading below titled "Develop life balance."

5. Practice relaxation techniques. Enhance your cognitive abilities and reduce stress, allowing your physiology to take a restorative break when you are under great demands. Consider using one or more of the techniques listed below to elicit the relaxation response, which calms the sympathetic nervous system and decreases heart rate and blood pressure [130]. Recent research indicates that relaxation can also elicit anti-oxidant and anti-inflammatory processes that counter the negative physical effects of stress [131]. Taking even a 10-minute break from the daily grind to focus on relaxing your body can pay big dividends. For many individuals, controlled breathing with a focus on relaxing your muscles will go far in allowing your body and mind the time it needs to regain a sense of balance, calm and mastery. It will also help you remain alert, energetic, and productive. Listed below are several relaxation techniques.

a. Diaphragmatic Breathing. Try to practice deep, slow breathing cycles every day. Diaphragmatic breathing (also referred to as "Tactical Breathing") involves breathing from your diaphragm, the muscle that separates the chest and abdomen, which helps exchange oxygen and carbon dioxide more efficiently (and which also comes about with increased levels of aerobic fitness). Diaphragmatic breathing is an excellent method for reducing the stress response. You can master diaphragmatic breathing by practicing during the day for brief periods (30 seconds at a time 10 times per day) which offers the greatest convenience. As you inhale through your nose, push your abdomen out, pausing at the top of your breathing cycle, followed by slowly exhaling through your nose while gently relaxing your abdomen, finally pausing at the bottom of your breathing cycle. Try to make each breath slow, rhythmic or wave-like. It is also beneficial to practice your deep breathing for sustained periods of relaxation of 10-20 minutes per day in one sitting. It can help your technique to sit comfortably, placing one hand on your abdomen and one on your chest, to gauge the rise and fall of your diaphragm.

b. Progressive Muscle Relaxation. By learning to alternatively tense and relax your muscles one at a time, you can help your body "re-learn" what it is like to reduce tension in your body. You can concentrate on "letting go" of the tension in each muscle, and then move on to the next muscle group. This strategy can also have enhanced effectiveness when paired with diaphragmatic breathing.

c. Guided Imagery. For many people, closing their eyes and visualizing a quiet, peaceful, relaxing setting helps to promote that very same feeling. Try to experience the setting with all of your senses. For example, if you

visualize laying on your hammock on a warm peaceful afternoon, try to imagine the warm, gentle breeze against your skin.

d. Word Repetition. Some people also find that just by closing their eyes and saying a word repetitively, for example, "relax," while they practice deep breathing skills, they will invoke a relaxed feeling that they begin to feel settling comfortably into their bodies.

e. Other Relaxation Techniques. Many people report increased focus and improved sleep, as well as decreased stress by using mindfulness meditation, flexibility exercises and movement arts, such as Yoga or Tai Chi or regular prayer. Many of these strategies can help you to gain a sense of balance in your life by enhancing spiritual or physical calmness.

Note that relaxation techniques are often most effective in enhancing your overall effectiveness and cognitive edge, as well as providing a brief opportunity to reset. However, some strategies may carry some risk, because the mind in a relaxed state can recall upsetting memories. Should this happen, Casey and Benson [130] recommend that you acknowledge the memory, but allow it to pass through then exit your thoughts and attention, rather than focusing or ruminating on your memory.

6. Journal. We have all enjoyed reading about the detailed accounts of diaries or journals maintained by past senior leaders. Keeping a journal is an excellent way not only to capture the historical account of many personal or professional actions you may have taken throughout the day, but it also provides an excellent tool to help you gain perspective and promotes greater relaxation. Some studies have also demonstrated a very positive immune system response to writing about emotionally significant events, such as combat. Like most stress management strategies, there are individual differences in effectiveness of the journaling technique. While many individuals find that journaling helps, not everyone will find it effective. If you find that journaling is ineffective or creates more distress, it may be beneficial to temporarily cease journaling and resume in the context of counseling to help process that experience.

7. Develop life balance. There are many professional demands of senior and mid-career leadership. It can be important to prioritize activities and time needed for family relationships and friends as well as leisure activities that renew you – creating and maintaining connection with others is a key component of building resiliency and managing stress. This is similar in concept to "Battle Rhythm," in which strategic leaders keep from exhausting their troops by a developing a rhythm of pressing forward balanced with time for recovery. Many leaders find it useful to schedule family and personal events and activities on the calendar as committed time, analogous to the Training Schedule. Similarly, leaders may find it advantageous in managing near term demands by taking intentional breaks, for example dinner and evening together with family, then using the later evening to wrap up any unfinished work tasks. Recent research points to the importance of active over inactive leisure in mitigating the effects of chronic occupational stress and weight gain [132], adding further confirmation to the beneficial impact of an active lifestyle.

8. Avoid excessive alcohol use. Alcohol use can interfere with your sleep pattern, as it often assists with sleep onset, but increases sleep disruption (wakefulness during the night and early in the morning) and decreases sleep quality. The result is that you feel less rested and more fatigued since you have spent less time in restorative sleep.

9. Establish or strengthen your social connection. We are social beings, and having a strong sense of connection is a pillar of resiliency. Most of the time, connecting with other people will help us reduce stress through the social support and bonding that occurs. Studies have demonstrated that those soldiers who "bonded" with a "war buddy" and talked about stress and experiences, lived significantly longer, on average, than those who did not establish any personal bonds. Invest in family and personal friendships by developing and strengthening social relationships and spending time with the people in your life. Relationships are the more durable and lasting supports that provide personal satisfaction throughout life. Fulfilling personal relationships are considered fundamental to strong personal resiliency and managing life stressors as they occur [133].

10. Consider getting a pet. For many people, pets provide a source of enjoyment and relaxation. They also provide a daily opportunity to "walk them" which then provides you the opportunity for increased exercise and fitness.

The strategies described above are an excellent starting point to bolster your resiliency and better manage stress, however if you feel your stress has reached a level such that you can no longer control its effect on your life or if it is causing you distress or impairment, then you should seek professional advice. Moreover, if you ever feel you or someone else's safety is in jeopardy you should seek immediate professional assistance. You can consider discussing your concerns with your primary healthcare provider, a psychologist, behavioral healthcare provider, or chaplain.

Sleep, Health and Leadership

Getting good, restorative sleep is an essential component of healthy living and effective performance for all leaders and those you lead. The research on sleep is compelling and consistent: Leaders think most clearly when they get about eight hours of sleep per night. Although they may train themselves to *feel* like they need less sleep, leaders who consistently sleep less than eight hours per night will see their performance stabilizes at a lower level than leaders who consistently get eight hours. '[134] The lesson is clear. Leaders can train themselves to feel their best after getting less sleep, but they won't actually be their best.

Since 9-11, the rates of insomnia reported in the Armed Forces has doubled [135]. Reflecting a growing realization that adequate sleep is essential for health, wellbeing, and human performance, the Army published revised guidelines for sleep in 2009 which highlights that performance degrades for soldiers who get less than 7 to 8 hours of sleep per night.

Sleep Problems and Degraded Health and Performance. Research also suggests multiple adverse effects on health (e.g., headaches, fatigue, mood problems, chronic pain, slowed metabolism, obesity, hypertension, and greater risk for diabetes and heart disease) and degraded performance on physical tasks (reaction time) and cognitive tasks (memory, concentration and mental alertness) in those who are chronically sleep deprived. In a simulated combat environment, these effects were typically greater than those produced

by hypoglycemia, alcohol intoxication, or some sedating drugs [134]. Importantly, brain research also highlights that risky behaviors tend to increase (i.e. individual shows less precaution) with sleep deprivation [136], which could affect performance throughout the deployment cycle. For example, sleep problems during and after deployment can indicate to leaders that a soldier may be at risk for problems in other life areas.

Sleep Deprivation and Increased Suicidal Risk.. Recent research also highlights the critical link between sleep deprivation and increased prevalence of suicidal thoughts and actions [137]. This research shows that individuals can experience a greater prevalence of negative thoughts and emotions with sleep deprivation.

Combat Stress and Insomnia. There is promising research underway for reducing symptoms of combat stress by improving sleep quality and duration. One finding from ongoing research is that decreasing the elevated adrenaline level associated with nightmares, using Image Rehearsal Therapy and / or medication can result in improved sleep, as well as reduced anger and improved concentration [138]. This line of research shows a general reduction in combat stress-related daytime symptoms when the service member recovers his or her sleep. Increasingly, sleep recovery is seen as a primary target in efforts to reduce PTSD-related symptoms such as anxiety and hyper vigilance [139].

These findings illustrate is the importance of leader "self-care" , and also how adequate sleep is essential to your optimal performance as a leader. However, as you have likely experienced sometime during your professional career, demands of leadership, family, professional development and other important domains in your life can impact your ability to obtain consistent, restful sleep. You might consider improving your sleep by attending a Restorative Sleep class or consulting with an APFRI Executive Enhancement psychologist. The strategies listed below can also be a great place to begin improving your sleep quality:

Maintain a regular sleep schedule. Your body responds the best to a structured, consistent schedule. If you keep sleep/wake times very similar every day (within one hour of variance, including weekends), your body will respond by starting to feel sleepy at your desired bed time. Although this strategy can be difficult, by making a sleep a priority every night you will enhance your overall effectiveness and set the example for those you lead, allowing them to do the same.

Don't lie awake in bed for extended periods. If you wake up at night or cannot fall asleep, do not toss and turn or lie awake in bed –you may find yourself getting frustrated. The more time you spend awake in your bed, the better you become at being awake in bed. If you have not fallen asleep after 20-30 minutes, get up and do something relaxing - avoid activities that strongly stimulate your brain (e.g., pressing or stressful matters at work, reading intense novel) or involve bright lighting, as these activities will contribute to wakefulness. When you feel tired, return to bed and try to fall asleep. This will allow you to minimize awake time in bed and, after a week or two, your body will begin to strongly associate being in bed with feeling sleepy.

Don't watch the clock. Clock-watching allows your mind to stay engaged and may even create anxiety. As a leader, your mind is used to being fully engaged and processing information. In order to "turn off" this habit at bedtime, turn your clock away from you and out of reach so that you are less likely to at it.

Prepare your mind for sleep in 3 steps. One common question of high-achievers who struggle with sleep is, "What if my mind won't turn off?" Leaders, especially given the demand of leadership, can have difficulty relaxing their mind for successful sleep. 1) Conducting a brief evaluation of daily events and lingering problems can help you fall asleep because you can take your mild off what is not yet accomplished. One easy way

to do this is to write down a list of problems, possible solutions and current courses of action and review that list for a few minutes before you wind down. You can also utilize the list if you wake during the night with something on your mind, .2) Next, employ deep, rhythmic diaphragmatic breathing (see Diaphragmatic Breathing above) to induce a state of relaxation. 3) Finally, by keeping your focus on your breathing technique and on the goal of attaining deeper relaxation, you can eliminate the thoughts that distract you from sleep [140]. Use these three strategies in combination to effectively "turn off" your mind [141] - Don't forget that implementing a **wind-down period** in which you permit no work or problem-related activities for at least 30 minutes prior to bed time is also a helpful way to consistently prepare your mind for sleep. Finally, by keeping your focus on the goal of attaining deeper relaxation, you can effectively "turn off" your mind, which can also be a useful tool in helping to prepare your mind for sleep.

Make sure that your bedroom is comfortable. Your bedroom should be a sanctuary for sleep. Use calm, soothing colors and decorations (e.g., no bright yellow walls), control the temperature so that you do not wake up due to being too hot or cold, and eliminate any ambient light or noise that might invade your room at night.

Use your bed only for sleep. Your body has the capability of building strong associations between different stimuli in the environment and feelings or behaviors. With this in mind, you can train your body to automatically feel sleepy when you lay down in bed. Do this by eliminating all activities in bed (e.g., watching television, reading, e-mailing) other than sleep and sex. Remember, the more time you spend awake in your bed, the better you become at being awake in bed.

Anger and Cardiovascular Disease

Under the right circumstances, anger can be an effective leadership tool. For instance, when subordinates or organization are under attack, their leader's anger conveys loyalty. [142] We all can think of instances when a leader's anger, or fear of that anger, inspired us to work a little harder. However, over the years, the link between anger and negative physical health has been well established. This is particularly relevant for soldiers familiar with combat stress. According to a study completed by Ouimette, both "trait anger" and "anger-in" (as found in post-traumatic stress disorder) are associated with both poorer physical functioning as well as poorer general health [143]. In this study, these measures of physical heath were derived from "physician-identified medical diagnoses" that were made over a year during which time the subjects were being followed. More specifically, the link between anger and cardiovascular health has also been well documented. In one study a total of 1305 men were followed over a seven year period and the researchers found, "Men who reported higher levels of anger had increased risks of total CHD" and "Being in the highest category of anger was associated with about 60% excess risk of nonfatal CHD" [144].

Another study published in 2000 found similar outcomes. According to Williams, a very large sample of men and women (N=12,876) were followed for "trait anger" and risk for "combined" coronary heart disease [146]. Subjects were followed over the course of about 4 to 6 years. In summary, the researchers found that among all individuals, increased levels of trait anger were associated with combined CHD as well as acute MI (myocardial infarction or heart attack) and fatal CHD. Furthermore, among individual with normal blood pressure, elevated levels of trait anger were associated with twice the risk for combined CHD and three times greater risk for acute MI and fatal CHD [145].

There are a wide variety of tools that are proven to be effective in anger management. The AFPRI Executive Enhancement Program and Mayo Clinic recommend some of the following tools to help reduce anger: [147].

- **Take a "timeout" to cool off:** Abraham Lincoln famously wrote scathing letters when he was angry that he never actually mailed. When angry, we are often certain we are 100% right and somebody else is 100% wrong. Anger tends to narrow our thinking, but after cooling off we recognize there is "more to the story." Often just a few minutes is enough to reduce your temper and regain some perspective before you do or say something that will add fuel to the fire. Perhaps you can take a walk, get a drink of water, take some deep breaths, or look at some pictures of your family and friends. Simply "breaking the chain" of events leading you down the path to anger may give you time to refocus,
- **Think first…then act:** Frequently, when angry, the tendency is to react based on emotion rather than on rational thought. Consequently, anger-based actions (such as yelling or striking things) have second and third order effects that can hurt others and damage your relationships, credibility as a leader and your career. Interestingly, recent research in social neuroscience confirms that there is a brief period of awareness before an action associated with that emotion. We can think of this moment of realization as a decision point when 'veto power' can be exercised over the action. By focusing awareness (doing a self-check), a person can build the capacity for restraint. Suggested **applications** can also **include control of overeating and enhancing** the essential **leadership** skill of listening [147].
- **Get away temporarily from the person or issue with whom you are struggling:** Sometimes it's helpful to simply step away from the person or the task that is upsetting. However, it isn't helpful to step away if you then ruminate about why you are angry after walking away, begin to think about something else…for example, a pleasurable hobby or a project that you have been working on.
- **Talk about your anger in a calm manner**: Speaking or yelling in an angry tone reinforces angry feelings and degrades problem solving. Forcing yourself to speak through the issue, calmly and without anger, enhances problem solving, improves self awareness, and breaks the anger cycle.
- **Redefine the problem**: Frequently problems or difficulties in our life can lead to anger. Sometimes we intensify our anger by viewing the problem as a threat or misperceiving the problem to be more difficult or threatening than it really is. Consequently, review the problem with a "rational" eye, looking for irrational beliefs that need to be modified.
- **Exercise regularly:** Many studies have repeatedly demonstrated that regular aerobic exercise is very helpful in reducing anger…as well as anxiety and depression.
- **Schedule personal time:** For individuals that are high intensity, career oriented, hard working, and success driven; finding time for hobbies and personal interests is difficult. Allowing time for activities that we find enjoyable will help restore balance and reduce stress, hurt, and anger associated with excessive work and chronic self-sacrifice.

- **Schedule problem-solving time**: Given our potentially busy and hectic culture, it is helpful to schedule time to focus on stressful problems. Planning in advance to dedicate time to a particular issue reduces the time pressure surrounding the crisis and identifies the problem as valuable and worthy of our attention.
- **Let go of old grudges or bitterness:** Ruminating about old hurts rarely produces productive coping or anger reduction doesn't contribute to effective leadership or your health. Organizations need their leaders to move them toward a positive future, not dwell on unpleasant memories. Rather, repeatedly reminding yourself of why you are angry will only serve to increase your anger. Leader take a long-term perspective, reminding themselves that the past is behind them, or "It really doesn't matter in the big picture", "Maybe I misunderstood", and/or "Who cares?" Letting it go means to let go of your reason or justification for being angry.
- **Use humor:** It's very difficult to laugh and be angry at the same time. Thus, distracting yourself with something humorous helps to break the anger cycle. Even better, try to find something funny regarding what you are angry about. It will not only reduce your anger, but also help keep things in perspective and likely help you find a more suitable solution to the problem. An advanced skill set toward reducing anger includes learning to chuckle at oneself; not taking oneself too seriously helps one to gain perspective on the type and degree of personal reaction.
- **Practice relaxation skills to reduce arousal:** Daily relaxation techniques (such as Diaphragmatic Breathing, Progressive Muscle Relaxation, etc.) help to "turn down the volume" by reducing physiologic activation. Keeping your day to day mood less intense creates more buffer when bad things happen. Plus, well practiced relaxation techniques are more useful or "deployable" when under pressure.

Multi Slice Computed Tomography (MSCT,USASMA Resident Students)

MSCT is a non-invasive and rapid scanning device that can provide an accurate quantitative measurement of coronary artery calcification. The calcification is the deposit of calcium in the heart's coronary arteries that develops from plaque buildup. The scan is designed to determine an individual's coronary artery disease risk factors to identify the individuals who are at increased risk for cardiac events. Numerous studies have demonstrated the relationship between coronary artery calcification and the pathologic presence of atherosclerotic heart disease. The information obtained from this scan is a valuable component in a comprehensive evaluation of overall cardiac status, complementing the physical examination and other laboratory studies done to assist you and your healthcare provider to control risks for cardiac events.

The MSCT is performed throughout the academic year for USASMA Resident Students as part of research collaboration with William Beaumont Medical Center, Department of Radiology. An MSCT has been offered to USASMA students since 2005. The vast majority of MSCT scans completed on USASMA students indicated the absence of fixed or significant obstructive coronary heart disease. Nevertheless, a small percentage of the scans performed result in scores indicative of the presence of atherosclerotic heart disease (MSCT score greater than zero). All individuals with an MSCT score greater than zero should consult with their primary healthcare provider to aggressively decrease any modifiable risk factors for CVD.

APPENDIX 1: Body Mass Index Table

Body Mass Index Table

	Normal						Overweight					Obese										Extreme Obesity														
BMI	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**
Height (inches)																		**Body Weight (pounds)**																		
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239	244	248	253	258
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222	227	232	237	242	247	252	257	262	267
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	255	261	266	271	276
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264	269	275	280	285
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246	251	256	262	267	273	278	284	289	295
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254	259	265	270	278	282	287	293	299	304
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262	267	273	279	285	291	296	302	308	314
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309	315	322	328	334
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287	293	299	306	312	319	325	331	338	344
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295	302	308	315	322	328	335	341	348	354
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338	345	351	358	365
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313	320	327	334	341	348	355	362	369	376
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322	329	338	343	351	358	365	372	379	386
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368	375	383	390	397
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340	348	355	363	371	378	386	393	401	408
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350	358	365	373	381	389	396	404	412	420
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399	407	415	423	431
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	353	361	369	377	385	394	402	410	418	426	435	443

Source: Adapted from *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report.*

APPENDIX 2: APFRI Class and Lecture Descriptions

Fitness Classes

Aerobic Fundamentals: This class will focus on the practical and educational components of cardiorespiratory power for all levels of fitness ability. Participants will learn correct methodologies for schedule planning, interval training, gauging intensity, and durations for physiological resilience, weight loss, and athletic performance.

APFRI Peak Performance: This hands-on class provides a unique training techniques that improves overall muscular strength and endurance, core strength, agility, balance and functional movement by incorporating the whole body, multi-planar movements utilizing a variety of training devices.

Basic Strength Training: This hands-on class emphasizes on proper body mechanics and techniques utilizing weight machines to develop and improve strength while promoting safety to minimize the risk of injury.

Flexibility/Range of Motion: This hands-on class promotes the utilization of proper techniques and correct principles to perform stretching for injury control and functional fitness.

Lumbar Stabilization: This hands-on class encourages the contraction of the deep muscles of the core to provide improved foundation to reduce the incidence of low back pain and promote function.

Strength Fundamentals: This class is a combination of practical and educational components of resistance training for all levels of fitness ability. Participants will learn proper techniques in performing advanced resistance exercises to improve functional strength.

Supplemental Fitness Classes

Supplemental Fitness Classes vary from one APFRI location to another. For additional information on supplemental fitness classes available at your APFRI location, please contact the APFRI Executive Fitness Program for a current schedule.

Aerobic Power Walking: This class will address the benefits of power walking and provide instructional and practical training techniques and other fun tips to help create a safe and successful exercise program. Participants will practice power walking techniques on the track, so wear appropriate walking shoes.

Introduction to Indoor Cycling: This class will focus on improving aerobic conditioning through indoor cycling. Class includes instruction in proper bike set up, basic use and safety, and monitoring of intensity through direct and indirect measurement.

Olympic Weight Lifting Basics: This class will cover the basic concepts of olympic weight lifting. Class will emphasize safety, basic biomechanical principles, olympic movements with progression, program design, and stretching and flexibility.

Physioball: This class utilizes physioball in challenging the core muscles to develop upper and lower body strength, core stability and overall functional balance.

Teen/Parent Strength Training: This class is intended to educate parents and teens on the safe and effective use of strength training equipment. The content of the class will emphasize proper technique, safe exercise habits and responsible conduct in a strength training area. Teenage attendees will be used as demonstrators on the equipment to emphasize the importance of proper technique. Class content will also include handouts and a specific strength training form for teen's ages 13-16 years.

Fitness Lectures

Back to Basics: This presentation provides audience with information to increase awareness of the etiology of the low back injuries and teaches strategies to effectively address and manage low back injuries.

Modular Fitness: The demands of a high OPTEMPO and deployment place unique challenges on maintaining regular exercise routines and physical fitness. This presentation provides alternative strategies that can be used to maintain aerobic fitness and strength during periods of high OPTEMPO or deployment.

Essentials of Strength Training: This presentation stresses the importance of strength training and the foundational concepts of exercise. Class content addresses strength training and running performance, machines versus free weights, and exercises for deployment conditions. Strategies to increase strength, power, and lean muscle mass are discussed, as well as how these gains can improve performance on Physical Readiness Tests.

General Fitness: This class will present the importance of aerobic conditioning and strength training to the reduction of cardiovascular risk factors. It will place particular emphasis on the impact of aerobic conditioning on hypertension, diabetes, and abnormal lipid panels. Additionally, class content will incorporate the impact of strength training as it relates to these risk factors, as well as the impact of this training upon body composition and bone density.

Increasing Aerobic Power: This class emphasizes training strategies to improve performance on Physical Readiness Tests. Topics of discussion will include running techniques, the concept of aerobic fitness, and the importance of varying one's training regimen to maximize results. Designed for individuals who desire to increase their aerobic fitness and improve their performance.

Health and Nutrition Class Descriptions

Cholesterol: The Good, Bad, and Ugly. This class provides the most up-to-date information from the National Cholesterol Education Program (NCEP) guidelines for participants with high cholesterol and those with a family history of coronary artery disease. Areas discussed include coronary artery disease, risk factors, definitions of the different lipid values and comparisons of your numbers to the national standards, and the Therapeutic Lifestyle Change (TLC) diet.

Hypertension: The Silent Killer. Hypertension is also known as high blood pressure, the silent killer. This class provides information according to the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure guidelines. Specific areas

covered include hypertension prevalence, classifications, risk factors, interventions, and an in-depth discussion of the Dietary Approaches to Stop Hypertension (DASH) diet.

Nutrition: Eat Right to Fight. This class provides personal information that can be applied but also utilized in leading your Soldiers to a healthy lifestyle. Points to discuss include causes of weight gain, AR 600-9, fad diets, dietary supplements, MyPlate and appropriate portion sizes, changing eating behaviors, reading the food label, and tips for eating out.

Diabetes Prevention. The class provides a general overview of the risk factors, symptoms, and prevention strategies for pre-diabetes and discusses dietary approaches to curb an insulin surge, manage sugar sensitivity, and promote weight loss. The class also describes the mechanism and rationale for conquering insulin resistance and compares glycemic index versus glycemic load in choosing carbohydrate rich foods. The class, however, does not target individuals who have already received a diagnosis of diabetes.

Executive Enhancement Program Class Descriptions

Leveraging Type-A Behavior. This class explains how the characteristics that are a foundation for success for senior leaders can also be detrimental to your overall health and well-being. The type-A behavior is associated with hypertension, heart disease, depleted immune system, and other health concerns, but is also associated with leadership and high achievement. This presentation focuses on honing the edge to simultaneously optimize strategic leadership capabilities and improve health and well-being.

Restorative Sleep: Retake the Night. Sleep disturbance is one of the most common problems described by service members at all levels of leadership. This lecture explores the biological and behavioral bases of sleep disturbance and the relationship between sleep quality and optimal performance. Strategies for improved sleep are discussed at a practical level for immediate implementation.

Anger Management: Frustration, Anger and Health. Anger is an assault in which the force used greatly outweighs the threat, therefore often disruptive to professional and personal relationships. Anger and hostility are also related to an increased risk for heart disease. This lecture examines origins of anger and the second and third-order effects of the anger response as it relates to personal health and well-being, and organizational effectiveness. Strategies are presented to refocus the energy available for the anger response toward prevention and problem-solving tactics.

Executive Stress Management. Stress results from demands exceeding available resources, and is a risk factor for cardiovascular disease, hypertension, and diminished immune response. This class explores methods for sustaining the strategic leader through building resources to manage increasing demands and modification of leadership strategies to maximize the benefit of the support structure.

Supplemental Executive Enhancement Program Classes

Understanding Combat Stress. This class presents combat stress through the eyes of a senior leader. It discusses issues associated with optimizing a leader's ability to endure combat stress. This includes a discussion of life course events, the impacts of mental intensity on health, leadership personality issues, and factors that influence human resiliency.

Leading Experienced Soldiers: Capitalizing on Growth in Combat. The current operational environment dictates that many of the Soldiers you lead will have combat experience. Experienced Soldiers bring a great deal of tactical and operational knowledge to the fight that can be leveraged for the benefit of the unit. Although some of those experiences can lead to combat stress symptoms, not all combat is traumatic and the vast majority of experienced Soldiers do not develop Posttraumatic Stress Disorder (PTSD). This lecture explores how a senior leader can recognize the natural changes that occur during deployment and maximize the benefit of growth that results from a being in a combat environment.

APPENDIX 3: APFRI Health and Fitness Programs

APFRI Running Shoe Clinic

Running is an excellent way to maintain or improve aerobic fitness. Unfortunately, many runners experience lower extremity injuries and/or pain at some point in their running career. These injuries can become chronic if the individual continues to train with the incorrect shoes. The most common abnormality seen in runners is "over-pronation." Over-pronation is an excessive inward rolling of the ankle. Continuing to run with excessive over-pronation may lead to a number of conditions such as plantar fasciitis, shin splints, Achilles tendonitis, patella-femoral syndrome and arch pain. Appropriate running shoes that provide the proper degree of stability are needed to correct this condition. Over 31%* of individuals who have participated in APFRI's Running Shoe Clinic have been found to be in the wrong biomechanical shoe for their particular running style.

The goal of the APFRI Running Shoe Clinic is to control running-related injuries and pain. Educating individuals on how to select the proper running shoes based on their running style and training techniques will help achieve this goal. The running shoe clinic consists of four main components: an initial interview, a dynamic plantar pressure measurement, a digital video analysis, and finally the outbrief. The initial interview captures past injuries as well as exercise history. The dynamic plantar pressure measurement is obtained using the Emed® pressure platform system. This system measures the dynamic pressure distribution that each foot exerts as it moves through a normal step. The digital video analysis involves recording the person's foot motion while running on a treadmill, both while barefoot and while wearing running shoes. The APFRI staff member performing the outbrief analyzes the video recording as well as the plantar pressure report in order to formulate a recommendation. Based on a consideration of several factors, each participant is provided a list of appropriate running shoes to match the person's foot structure and motion. Running shoe clinic participants also receive a summary report for future reference.

*Based on data collected between Nov 2005-Mar 2009.

Achilles InSight Bone Mineral Density Scan

Bone is a living, growing tissue made mostly of collagen that is strengthened by calcium. Throughout life, bone is constantly renewed through re-absorption of old bone and formation of new bone to replace the old. Bone can be thought of as a bank account where you "deposit" and "withdraw" calcium which is vital for metabolism and life processes. For most people, bone formation continues at a faster rate than removal until bone mass peaks during the third decade of life. After age thirty, bone "withdrawals" can begin to exceed "deposits". When bone removal occurs too quickly or replacement occurs too slowly, or both, a disease called osteoporosis can result. If not treated, osteoporosis can progress to bones becoming fragile and fractured. The Surgeon General's Report on Bone Health and Osteoporosis warns that one in two women and one in four men over 50 years of age will have an osteoporosis-related fracture in his or her remaining lifetime [76].

Bone mineral density (BMD) is measured to determine an individual's risk for osteoporosis. Bone mass typically peaks between the ages of 30-35 years. By testing BMD near this age, a baseline measure is established which can be used for comparison to future measurements to assess bone mass changes over time. The heel has been determined to be the optimal peripheral site for osteoporotic fracture risk assessment. According to the Foundation for Osteoporosis Research and Education (FORE) there is an 85% correlation

rate between test results of your hip, spine and peripheral sites [77]. In other words, BMD in one part of your skeleton will look much like the BMD in other bones.

Your BMD is compared to an established norm or standard in order to give a score and then your BMD test results are compared to the ideal or peak bone mineral density of a healthy thirty-year-old adult of the same sex. This BMD measurement is provided in a T-score that corresponds to diagnostic criteria defined by the World Health Organization (WHO). A T-score between +1 and -1 signifies normal bone mass. A T-score between -1.0 and -2.5 indicates you have low bone mass (also known as osteopenia), although not low enough to be diagnosed with osteoporosis. A T-score of -2.5 or lower indicates you have osteoporosis. While not everyone who has low bone mass will develop osteoporosis, everyone with low bone mass is at higher risk for the disease and the resulting fractures.

To maintain BMD APFRI recommends:

- Consume at least 1,000-1,200 mg of calcium daily through food sources or a supplement if necessary. A serving of fat-free or low-fat milk product will provide approximately 300 mg of calcium. Examples of one serving are 1 cup yogurt, 8 fluid ounces milk, or 1 ½ ounces of hard cheese. If adequate calcium is not obtained through diet or supplements it is pulled from the bones. Calcium is best absorbed when taken in small amounts (500mg or less) throughout the day, preferably with a meal. Several studies do show, however, that men who consume more than 2,000 mg of calcium daily have an increased risk for prostate cancer with no additional benefit to bone density [78].
- Obtain 600 IU- 800 IU of vitamin D daily. Without sufficient Vitamin D, calcium absorption cannot be maximized. This amount can be obtained with a supplement of 400 IU along with 15-20 minutes of exposure to sunlight each day. Dietary sources of vitamin D include low-fat dairy products, egg yolks, fatty fish and liver. Keep in mind that egg yolks and liver are a high source of saturated fat and should be consumed in moderation.

- In supplements and fortified foods, vitamin D is available in two forms, D2 (ergocalciferol) and D3 (cholecalciferol). Vitamin D3 could be more than three times as effective as vitamin D2 in raising serum concentrations and maintaining those levels for a longer time. [3,4]. Many supplements are being reformulated to contain vitamin D3 instead of vitamin D2.
    - The recommended amount of Vitamin D can also be obtained with a supplement of 400 IU along with 15-20 minutes of exposure to sunlight each day.
    - Perform weight bearing aerobic exercises
    - Participate in muscle strengthening exercises at least 3 times per week. Strength training's effect on bone density is dose responsive. According to research, women who lifted the most weight over time experienced the greatest improvement in BMD [79].
    - Avoid all tobacco products.
    - Avoid excessive alcohol intake (over 7 drinks per week for women or over 14 drinks per week for men).

- Limit cola consumption. The Framingham Osteoporosis Study found a 4-5% lower hip bone density in women who consumed one cola a day than in those who drank less than one cola per month. Bone density was not linked to cola consumption in men [80].

Biodex™ Balance System

Impaired balance can make it difficult or even impossible to perform many basic activities of life. As with other fitness parameters that decline with age, such as loss of lean muscle mass and flexibility, balance is another very important physical attribute which can diminish with age. In addition to affecting function, impaired balance may contribute to injuries. Conversely, lower extremity injuries may result in balance impairments in otherwise healthy individuals.

The ***Biodex™*** Balance System is a tool used to assess balance. Using this unique device, the clinician can evaluate a person's ability to maintain postural stability on an unstable surface, while standing on one or both legs. When testing is conducted with the subject standing on one leg, the performance of the left and right legs can be compared, allowing the clinician to assess whether additional balance training is warranted for either or both lower extremities.

The ***Biodex™*** Balance System is an additional service offered by APFRI and is primarily for the evaluation of those who have a history of lower extremity injury or known balance impairments.

ReeVue Metabolic Testing

The ReeVue Metabolic Test is a tool to assess your resting metabolic rate and provide you with a personalized daily caloric intake guideline to meet your nutrition goals. During the 10-minute test, the ReeVue calculates oxygen consumption by measuring the concentration of oxygen inhaled and comparing it to the concentration of oxygen exhaled. The number of calories burned by the body is directly proportional to the amount of oxygen consumed.

The ReeVue Metabolic Test is an additional service offered by APFRI and is reserved for the evaluation of participants with overweight/obese issues, other medical problems, and those enrolled in Executive Wellness Programs such as the Senior Leader Fitness Program and Senior Leader Nutrition Program.

Sports Injury Prevention Program

Although the over-40 population is at higher risk for sports injury than younger athletes, appropriate exercise progression prior to and during the season as well as sport-specific exercise preparation can significantly reduce a student's risk of becoming a sports injury statistic.

A sports injury control program was put in place after a large number of students playing softball, volleyball, basketball, and/or participating in Jim Thorpe Sports Days sustained sports injuries. The success of this program requires support from and close coordination with seminar sports representatives, team coaches, Health Clinic staff, sports officials, and especially the command group leadership. However, the active involvement of each student in their own sports preparation and injury control remains the key in decreasing both the incidence and severity of sports injuries.

Upon request, APFRI's exercise professionals provide training lectures and on-field or on-court instruction in appropriate training techniques, as well as distributing educational exercise handouts and sport-specific training brochures.

Jaeger Oxycon Mobile Metabolic Unit

The Jaeger Oxycon Mobile Unit is a portable metabolic unit that determines levels of oxygen uptake while performing exercise. The device is designed to test both sub-maximal and maximal oxygen uptake during normal exercise conditions outside the laboratory setting. The Jaeger is a highly specialized device reserved for the evaluation of individuals identified by the APFRI Fitness staff.

APPENDIX 4: APFRI Executive Enhancement Program

Executive Enhancement Program

The USAWC's Executive Enhancement Program is a complementary program executed through the Army Physical Fitness Research Institute (APFRI). The EEP, directed by APFRI's Clinical Psychologist, is focused on developing senior leader self-awareness, psychological hardiness, resiliency, and proactive stress management to both enhance strategic leadership attributes as well as reduce the toxic components of Type A behavior, stress, and OPTEMPO demands. The Executive Enhancement Program consists of the Leadership Feedback Program (LFP) and the Senior Leader Enhancement Program (SLEP).

The USAWC's **Leadership Feedback Program** (LFP) is a complementary program that provides all U.S. Army War College students the opportunity to enhance their leadership abilities via an integrated program of behavioral and personality assessments, with particular interest in how these psychological factors impact on health, fitness, and effectiveness. Assessments include: a 360-degree assessment survey (compares self ratings of leadership behaviors with assessments from superiors, peers, and subordinates); a measure of team roles (identifies preferred functions when on a team); and a detailed measure of personality (how individuals think, feel, and interact with others across a variety of situations).

Specifically, the LFP provides the capability to ensure increased self-awareness for our students in the four areas of leadership below, among others:

- Intellectual Capability: Situational awareness, problem-solving, decision-making, ability to think creatively and adapt to new ideas (mental agility)
- Emotional Fitness: Intrapersonal awareness, resiliency, hardiness, Type-A, adaptability, ability to keep things in perspective, resolve, sense of humor
- Interpersonal Skills: Ability to inspire and motivate, assess capabilities and limitations of subordinates, approachability, communication (verbal & nonverbal), cultural awareness, negotiation skills, visibility and presence
- Team-Building: Ability to form effective teams, establish trust, confidence, & cohesion, distribute authority, foster & coordinate team effort

The goal is to increase participant self awareness so that each participant has a clear picture of potential developmental growth to improve their strategic leadership.

Senior Leader Enhancement Program (SLEP): follows up on issues or challenges identified in either APFRI's Health and Fitness Assessment and/or LFP that relate to leadership, self-awareness, and/or personality traits that may interfere with health, fitness, and achieving full leadership potential. This series of programs also focuses on helping

to promote understanding about the important link between emotions, health, and fitness. Individuals are invited to participate in the SLEP based on their anger expression scores and other psychological measures completed as part of the APFRI Health and Fitness Assessment. The SLEP develops and provides appropriate interventions for students by employing three distinct programs.

Restorative Sleep. Many students, like many Americans, report that they have at least some concern with their ability to sleep soundly. The APFRI Restorative Sleep Program is a complementary program that addresses this concern through voluntary student participation in two activities. First, a noon-time lecture discusses potential causes of sleep disturbance and describes effective psychological strategies to reduce sleep disturbance and enhance sleep hygiene to improve the quality and quantity of sleep. Following this lecture, students may participate in individual professional consultations that provide specific recommendations and strategies to address concerns with sleep.

Executive Stress Management. "Type-A" Behavior can be very effective in helping leaders persist in overcoming challenges. However, excessive levels of stress can be incapacitating on leaders and dysfunctional on their families. The Executive Stress Management program consists of four sessions that will assist students in managing their stress levels so that they remain in the "functional" and "enhancing" levels while recognizing and avoiding the debilitating aspects of excessive stress.

Family Focus. Senior and mid-career leaders respond to many professional situations which greatly impact their families. APFRI recognizes that strong families contribute to strong leadership. APFRI supports the military family by sponsoring and facilitating lectures and individual consultations related to stress management, restorative sleep, reintegration, and other topics that help families manage the challenges of military life.

Each of these SLEP programs are scheduled and conducted periodically during the academic year. Students and family members will be notified of class dates and times by e-mail invitation or advertizing on digital signage.

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Army Physical Fitness Research Institute (APFRI)

The collage on the front cover is rich in symbolism and military history. APFRI is centered at the US Army War College and as represented on the historical front entrance, the War College's mission is "not to promote war, but to preserve peace." This statement of purpose is represented in two important ways. First, a feint image of a canon in the lower left corner is turned away but represents vigilance and readiness to preserve the peace. A second representation marks the intellectual promise and presence of the founder of the war college, Elihu Root, with his image resting just above Root Hall, the academic foundation for the U.S. Army War College. Just above the image of Elihu Root is the APFRI Assessment Center, linking leadership development with the health and fitness of our strategic leaders. The US flag, centered, and just above the war college entrance represents our national interests and flag waving to the right, the hope and "rightness" of our cause as a nation. The flowers, bright green grass, and water flowing from one of Pennsylvania's many springs, represent the beauty of Carlisle Barracks while also reflecting the anticipation and reinvigoration that both "springtime" and fitness and well-being bring, along with the cleansing nature offered by an APFRI assessment, hopefully motivating a change to more healthy habits. The gray limestone building in the upper right represents APFRI's assessment center and the legacy of the APFRI program and its focus on senior leader health and fitness. On the left side of the collage, the front entrance of the US Army Sergeants Major Academy at Fort Bliss, TX, reflects APFRI's first official APFRI Annex, an achievement that was followed closely by APFRI's expansion to the Command and General Staff College at Fort Leavenworth, KS. The hope and promise of APFRI is realized through the commitment and dedication of the multidisciplinary team; a team that helps each individual better understand the complex interplay of health, fitness, and leadership.

The Army Physical Fitness Research Institute

The U.S. Army War College

Carlisle, Pennsylvania