U.S. Army War College

Maximizing Senior Leader Health and Wellbeing

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MAXIMIZING SENIOR LEADER HEALTH AND WELLBEING

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PHYSICAL FITNESS GUIDANCE TO ACHIEVE OPTIMAL HEALTH AND PERFORMANCE

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> The chief task in life is simply this: to identify and separate matters so that I can say clearly to myself which are externals not under my control and which have to do with the choices I actually control.
>
> Epictetus[1]

The ancient philosopher Epictetus encouraged people to identify the aspects of life that they can control. Today, he might advise senior leaders to prioritize activities that impact the quality of their lives positively. Choosing to remain physically active is an important behavioral choice that senior leaders can make now to improve health and optimize performance later in life.[2] Competing priorities, however, often force them to compromise in ways that detract from their long-term health and fitness goals. Understanding basic fitness principles will help senior leaders optimize physical adaptation and performance, allowing them to effectively and efficiently design an ideal physical fitness program that incorporates moderate to high-intensity cardiovascular exercise, functional fitness training, and flexibility training in a way that optimizes their health and performance.

1. Ryan Holiday and Stephen Hanselman, *The Daily Stoic: 366 Meditations on Wisdom, Perseverance, and the Art of Living* (New York: Portfolio, 2016), 136.

2. U.S. Department of Health and Human Services, *Physical Activity Guidelines for Americans*, 2nd edition, (Washington, DC, 2018), 118, https://health.gov/healthypeople/tools-action/browse-evidence-based-resources/physical-activity-guidelines-americans-2nd-edition.

Exercise is the foundation for achieving optimal health and performance.[3] Its benefits are immediate and affect the body's ability to prevent chronic disease, reduce stress, and improve sleep. This chapter examines current societal and military health trends, the systemic benefits of engaging in a routine physical fitness program, and provides guidance for prescriptive training to assist senior leaders with achieving their health and fitness goals within the constraints of competing professional priorities and time demands.

Trends – America, the Army, and the Army War College

America is in a health crisis. Although Americans are living longer, they are not necessarily living better.[4] Today, nearly 133 million American adults have one or more preventable chronic diseases.[5] Obesity, heart disease, diabetes, and some types of cancer are the primary causes of preventable premature death and reduced healthspan.[6] Although 70% of the most common chronic diseases can be prevented or managed to some degree through healthy lifestyle choices such as engaging in regular physical activity, only 25.3% of Americans reported being physically active in 2020.[7] Furthermore, the percentage of overweight and obese adults increased from 63.2% in 2011 to 66.7% in 2020, with approximately 75% of middle-aged Americans being overweight or obese.[8]

American service members are not immune to the significant public health concerns that plague Americans.[9] In a study from 2017 conducted in

3. Rob Newsom, "The Connection Between Diet, Exercise, and Sleep," Sleep Foundation, updated April 12, 2022, https://www.sleepfoundation.org/physical-health/diet-exercise-sleep.

4. Mark Mather and Paola Scommengna, "Up to Half of U.S. Premature Deaths Are Preventable; Behavioral Factors Key," Population Reference Bureau, September 2015, https://www.prb.org/us-premature-deaths/.

5. Wullianallur Raghupathi and Viju Raghupathi, "An Empirical Study of Chronic Diseases in the United States: A Visual Analytics Approach to Public Health," *International Journal of Environmental Research and Public Health* 15, no. 3 (2018): 2, https://doi.org/10.3390/ijerph15030431.

6. Healthspan refers to the period of life that is free from major chronic clinical diseases and disability. See Douglas R. Seals, Jamie N. Justice, and Thomas J. LaRocca, "Physiological Geroscience: Targeting Function to Increase Healthspan and Achieve Optimal Longevity," *The Journal of Physiology* 594, no. 8 (2016): 2001–24, https://doi.org/10.1113/jphysiol.2014.282665.

7. Barbara A. Bushman, "Exercise for Prevention of Chronic Diseases," *ACSM's Health & Fitness Journal* 24, no. 1 (2020): 8, https://doi.org/10.1249/FIT.0000000000000533; Center for Disease Control and Prevention, "Adult Physical Inactivity Prevalence Maps by Race/Ethnicity," accessed December 8, 2022, https://www.cdc.gov/physicalactivity/data/inactivity-prevalence-maps/index.html.

8. Center for Disease Control and Prevention, "Nutrition, Physical Activity, and Obesity: Data, Trends and Maps," accessed December 8, 2022, https://www.cdc.gov/nccdphp/dnpao/data-trends-maps/index.html.

9. Army Public Health Command, "2021 Health of the Force," 67, accessed December 8, 2022, https://www.health.mil/Reference-Center/Technical-Documents/2022/12/14/DOD-Health-of-the-Force-2021.

service members, 51% of the participants were classified as overweight, with an additional 13% classified as obese.[10] The researchers also found that 42% of the men and 6% of the women classified as overweight perceived themselves as being the right weight, despite their elevated body mass index (BMI).[11] Although the prevalence of obesity in active duty soldiers (18%) is lower than age- and sex-matched U.S. adults (27%), the prevalence of obesity among soldiers increases with age until the mid-forties, mirroring the pattern seen in the civilian population.[12] While the demanding physical requirements of the Army may, in part, limit significant BMI increases, they do not effectively offset opposing influences, such as poor nutrition, chronic stress, and lack of sleep.[13]

Despite historically having greater cardiorespiratory endurance and being at lower risk for heart disease than their civilian counterparts, U.S. Army War College (USAWC) students may still be at risk for preventable health concerns.[14] For example, nearly 70% of the military students attending the USAWC in residence during academic year 2021 were classified as overweight or obese. Additionally, 70% were classified as hypertensive, 46% had high total cholesterol levels (over 200mg/dl), and nearly 30% had low-density lipoprotein (LDL) levels above 130mg/dl (the normal range is below 100mg/dl). All of these health indicators can be influenced or managed through healthy lifestyle choices.[15]

America's progressively unhealthy lifestyle may be due in part to the persistent professional demands that have erased line between personal and private life.[16] Steadman, Britt, and Hammer recently surveyed

10. Heidi L. Clark et al., "Misperceptions of Weight Status in Military Men and Women," *Military Medicine* 182, no. 5 (2017): e1792, https://doi.org/10.7205/MILMED-D-16-00202.

11. Although there are some reliabilty concerns with the Body Mass Index (BMI), it is useful to identify individuals with BMIs at the extreme ends—very underweight or obese. BMI can be used to increase awareness, promote lifestyle changes, and change individual behavior. The CDC BMI calculator can be found here: https://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/english_bmi_calculator/bmi_calculator.html. For more information, see Take Care Staff, "The Pros and Cons of Measuring Obesity with BMI," accessed February 12, 2023, https://www.wrvo.org/post/pros-and-cons-measuring-obesity-bmi.

12. Army Public Health Command, "2021 Health of the Force," 51.

13. Tracey J. Smith et al., "Overweight and Obesity in Military Personnel: Sociodemographic Predictors," *Obesity* 20, no. 7 (2012): 1534, https://doi.org/10.1038/oby.2012.25.

14. John Duncan, Mark A. Vaitkus, and William F. Barko, "The U.S. Army War College and the Road to Executive Health and Fitness," in *The U.S. Army War College Guide to Executive Health and Fitness,* ed. William F. Barko and Mark A. Vaitkus (Carlisle, PA: Army Physical Fitness Research Institute, 2000), 1-21. https://www.cdc.gov/nccdphp/dnpa/usphs/pdfs/army.pdf

15. David A. Wright et al., "Physical Fitness and Cardiovascular Disease Risk Factors in Senior Military Officers," *Military Medicine* 159, no. 1 (1994): 60.

16. Dan Pontefract, "You Are Way Too Busy; It's Hampering Your Ability To Think And Be Productive," *Forbes* July 9, 2018, https://www.forbes.com/sites/danpontefract/2018/07/09/you-are-way-too-busy-its-hampering-your-ability-to-think-and-be-productive/?sh=1e4098dda4cc.

resident students at the USAWC and found that over 80% reported that work requirements negatively impacted their personal life (see Chapter 8). As one might expect, these officers reported increased stress levels and a lack of time and energy to conduct physical activity, eat properly, and get recommended amounts of sleep. The physical impacts of longer work hours may not be overt, but competing work-life demands can lead to choices that result in unhealthy physical and mental stress levels.[17]

Health Benefits from Exercise

Clear and compelling data demonstrate that routine physical activity improves psychological well-being, the quality and quantity of sleep, and reduces the risk of many chronic diseases and other adverse health outcomes. According to Alex Azar, the former Secretary of Health and Human Services, "regular physical activity is one of the most important things people can do to improve their health. Moving more and sitting less has tremendous benefits for everyone, regardless of age, sex, race, ethnicity, or current fitness level."[18] Nevertheless, many Americans struggle to translate physical activity guidelines into action.[19]

The 2018 *Physical Activity Guidelines for Americans* defines physical activity as basic human movement that includes walking, jogging, swimming, and some forms of yoga.[20] "Exercise is physical activity that is planned, structured, and repeated … to improve health, maintain fitness and is important as a means of physical rehabilitation."[21] It entails a level of planning and programming that enables progressive improvements in aerobic conditioning, muscular strength, and endurance. Finally, physical fitness is defined as "the ability to carry out daily tasks without undue fatigue and with ample energy."[22] This chapter addresses the eleven components of fitness in subsequent sections and aligns each within the construct of building an effective training program to achieve optimal performance in senior leaders.

As USAWC students often hear during their tenure in Carlisle, PA, "*What got you here, won't get you there.*"[23] The maxim is typically quoted in the

17. Matthew A. Stults-Kolehmainen and Rajita Sinha, "The Effects of Stress on Physical Activity and Exercise," *Sports Medicine (Auckland, N.Z.)* 44, no. 1 (2014): 13, https://doi.org/10.1007/s40279-013-0090-5.

18. U.S. Department of Health and Human Services, "Physical Activity Guidelines for Americans, 1.

19. Bushman, "Exercise for Prevention of Chronic Diseases," 5–10.

20. U.S. Department of Health and Human Services, 70.

21. "Exercise," The Free Dictionary, https://medical-dictionary.thefreedictionary.com/exercise.

22. Carl J. Caspersen, Kenneth E. Powell, and Gregory M. Christenson, "Physical Activity, Exercise, and Physical Fitness: Definitions and Distinctions for Health-Related Research.," *Public Health Reports* 100, no. 2 (1985): 126–31, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1424733/.

23. Marshall Goldsmith, *What Got You Here Won't Get You There : How Successful People Become Even More Successful* / (Westport, CT: Hyperion, 2007), 1.

context of strategic leadership, but it also applies to maintaining health and optimizing performance. Young adults seem to be able to get away with staying up late, eating less nutritious foods, and missing physical training sessions without lasting consequences. Senior leaders, however, are not as fortunate. Despite knowing the significant role regular exercise plays in maintaining a healthy lifestyle, senior leaders often forgo physical activity altogether to complete higher priority tasks at work or home.[24] Even the modest levels of physical activity recommended by the U.S. Department of Health and Human Services to achieve substantial health benefits may seem unobtainable to many (Figure 1).

Figure 1. Physical Activity Guidelines for Americans[25]

Aerobic Activity	**Muscular Strength and Endurance**	**Flexibility**
At least 150 minutes of moderate-intensity exercise or at least 75 minutes of vigorous-intensity (high intensity) exercise per week.	At least two days per week of moderate or greater intensity exercise that involves all major muscle groups.	Dynamic (before exercise) and static (during and after exercise) stretching conducted independently or as part of the training session.
Moderate intensity: run; bike, elliptical, swim, rower, recreational sports at 55-75% effort (6/7 RPE[1]) **Vigorous intensity:** Sprints, intervals, competitive sports at 80-95% effort (8/9 RPE)	**Moderate intensity:** full body weight-training 5-12 reps with 50-75% of 1-rep max and 45-90 second rest between sets. Increase intensity by reducing rest, increasing weight, or combining exercise into a circuit	**Dynamic stretching:** PRT[2] – preparatory drills **Static stretching:** PRT recovery drills, PNF[3], Yoga

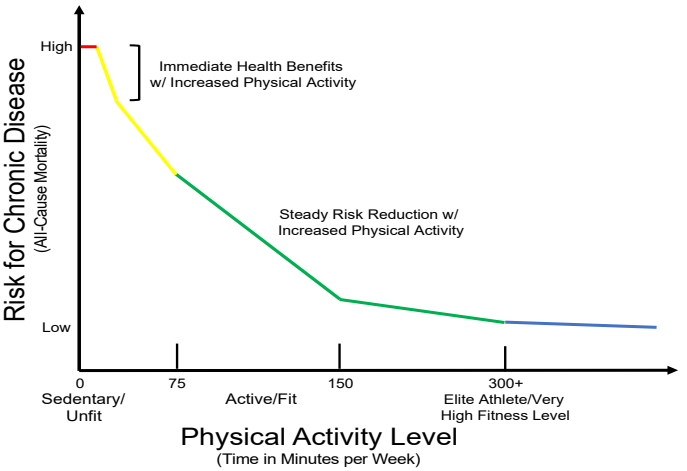
1. RPE: Rate of Perceived Exertion; **2.** PRT: Physical Readiness Training; **3.** PNF: Proprioceptive Neuromuscular Facilitation

Nevertheless, increasing the amount of physical activity through higher intensity, greater frequency, and/or longer duration benefits health outcomes in various ways.[26] For example, changes in physical activity that increase physical fitness levels can have immediate health benefits. Increased physical fitness can also help reduce the risk for or prevent many chronic diseases and other adverse health outcomes.[27] Figure 2 shows the relationship between physical activity levels and the risk of death from chronic disease. It highlights the immediate health benefits experienced from simply being physically active. It also depicts the steep health benefits

24. Duncan, Vaitkus, and Barko, 1.
25. U.S. Department of Health and Human Services, 11.
26. U.S. Department of Health and Human Services, 28.
27. Gunnar Erikssen, "Physical Fitness and Changes in Mortality: The Survival of the Fittest," *Sports Medicine (Auckland, N.Z.)* 31, no. 8 (2001): 571, https://doi.org/10.2165/00007256-200131080-00001.

gained by increasing time spent conducting moderate to vigorous physical activity per week. Moreover, conducting moderate to high intensity physical activity can help delay most preventable health-related causes of death and "compress overall morbidity across the healthspan."[28] In other words, dedicating time to exercise can extend the period of life free from major chronic diseases.[29]

Figure 2. Relationship of Risk for Chronic Disease to Physical Activity Level[30]



Prioritizing regular exercise is an effective way to reduce stress and its negative physiological effects.[31] In addition to engaging in physical activity, developing effective coping mechanisms such as employing relaxation techniques, yoga, and mindfulness meditation can also help reduce the physiological effects of stress.[32] Furthermore, physical activity sharpens cognitive ability, improves quality of life, increases time in deep sleep, and reduces daytime sleepiness. [33] As noted in Chapter 2, routine exercise also delays the onset of age-related physical changes and slows the body's natural degeneration of muscle mass and bone density. Similarly, commitment to physical activity sustains coordination and balance while preserving flexibility and reducing the potential for injury.[34]

28. Seals, Justice, and LaRocca, 2001.
29. Seals, Justice, and LaRocca, 2009.
30. This chart is based on the Department of Health and Human Services "Physical Activity Guidelines for Americans" and Dr. Barbra Bushman's research on "Exercise for Prevention of Chronic Diseases." See footnotes 2 and 7.
31. Stults-Kolehmainen and Sinha, 3-4.
32. Ginger Martire, "The Physical Effects of Stress: How Your Fast-Paced Life Can Kill You," *Dr. Ginger Martire* (blog), March 10, 2016, http://www.gingermartirephd.com/physical-effects-stress-fast-paced-life-can-kill/.
33. U.S. Department of Health and Human Services, 19.
34. Kent Adams, Patrick O'Shea, and Katie L O'Shea, "Aging: Its Effects on Strength, Power, Flexibility, and Bone Density," *Strength and Conditioning Journal* 21, no, 2 (1999): 65-77, https://journals.lww.com/nsca-scj/Citation/1999/04000/Aging__Its_Effects_on_Strength,_Power,.21.aspx.

Putting a comprehensive and well-informed plan into action is vital to establishing a feasible training program that yields the desired health and performance goals. The next section focuses on designing the optimal fitness program for senior leaders informed by physiological considerations and limited available time. It provides the framework to apply the principles of fitness appropriately and improve individual physical fitness and overall health.

Basic Fitness Principles

The human body is remarkably resilient and efficient at adapting to physical stressors.[35] In the context of physical activity, the two primary systems that enable human movement are the cardiovascular and musculoskeletal systems. When the body experiences challenging exercise, it adapts to the physical demands placed on these two systems in preparation for the next challenge. Although many senior leaders understand the role that both systems play in overall health and performance, their challenge remains making the time to devote to working out.

Cardiovascular endurance is one of the five health-related components of fitness and involves increasing heart, lung, and blood vessel efficiency. Conducting routine cardiovascular exercise can improve aerobic fitness and reduce the risk for cardiovascular diseases, some types of cancer, and obesity. [36] Despite its health benefits, however, cardiovascular exercise often requires extended periods of time. High intensity interval training (HIIT) sessions may be an ideal option for senior leaders to address aerobic fitness under time constraints.

Our physical capacity changes over the lifespan.[37] As the body ages, it naturally loses muscle mass and strength, especially after 60.[38] This process of age-related decrease in lean mass and strength is called sarcopenia (see Chapter 2). Many factors contribute to sarcopenia, but regular exercise helps maintain greater strength and endurance over time. Traditional muscular strength and endurance programs can offset age-related

35. Martin J. MacInnis and Martin J. Gibala, "Physiological Adaptations to Interval Training and the Role of Exercise Intensity," *The Journal of Physiology* 595, no. 9 (2017): 2915–2930, https://doi.org/10.1113/JP273196.

36. U.S. Department of Health and Human Services, "Top 10 Things to Know About the Second Edition of the Physical Activity Guidelines for Americans," Health.gov, Office of Disease Prevention and Health Promotion, last updated August 25, 2021, https://health.gov/our-work/physical-activity/current-guidelines/top-10-things-know.

37. Maria Westerståhl et al., "Longitudinal Changes in Physical Capacity from Adolescence to Middle Age in Men and Women," *Scientific Reports* 8, no. 1 (2018), 1, https://doi.org/10.1038/s41598-018-33141-3.

38. Keijo Häkkinen et al., "Changes in Muscle Morphology, Electromyographic Activity, and Force Production Characteristics During Progressive Strength Training in Young and Older Men," *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 53A, no. 6 (1998): B421, https://doi.org/10.1093/gerona/53A.6.B415.

musculoskeletal losses.[39] Even in older people, strength development resulting from strength training may include muscle growth if the overall training intensity and duration are sufficient.[40] For example, high-intensity free-weight training that includes squats and deadlifts can increase bone mineral density and help maintain flexibility and balance.[41] Incorporating a high-intensity training (HIT) program two to three times per week may delay the physiological effects of aging and maintain fitness and optimal performance across the lifespan.[42] Consequently, to achieve the desired physical improvements in performance and fitness, one must understand and properly apply the basic principles of training (see Figure 3) to the health components of fitness (see Figure 4).

Figure 3. Principles of Training [43]

Training Principle	Definition	Example
Overload	Exposing the body to physical demands greater than accustomed-to training stress to stimulate training adaptation.	Increasing speed or distance **or** increasing weight lifted or the number of repetitions in a **single training session** - requiring the body to work harder and adapt to added demand.
Progression	The gradual increase in training stress to sustain tissue overload and elicit continued training adaptation.	**Incrementally** adding weight or increasing the speed or distance **throughout a training period**.
Periodization	The deliberate systematic variation of a training program over time.	Changing a training program from strength-focused to endurance or vice versa.
Individualization	The modification to training that accounts for an athlete's unique capacity for exercise.	Training is adjusted according to age, gender, rate of progress, and previous experience.
Reversibility	The reduction of muscular tissue resulting in loss of beneficial fitness/performance adaptations.	Use it or lose it. It can be reversed when training is resumed.
Specificity	Fitness/performance improves through training specific movement patterns and intensities.	Strength – 1 - 6 Reps Power – 1 - 5 Reps Hypertrophy – 6 – 12 Reps Endurance – 12+ Reps

39. Adams, O'Shea, and O'Shea, 72.
40. Adams, O'Shea, and O'Shea, 72.
41. Adams, O'Shea, and O'Shea, 72.
42. Adams, O'Shea, and O'Shea, 70.
43. Korey Kasper, "Sports Training Principles," *Current Sports Medicine Reports* 18, no. 4 (2019): 95–96, https://doi.org/10.1249/JSR.0000000000000576.

Figure 4. Health Components of Fitness[44]

Component	Definition	Example
Cardiovascular Endurance	Ability to efficiently deliver oxygen to the body.	Running, cycling, rowing, swimming, HIIT,[1] and HIFT[2]
Muscular Strength	Amount of force a particular muscle group can produce.	Squats, Deadlifts, Bench Press, Pull-ups for 1-6 repetitions
Muscular Endurance	Applying repeated force from a particular muscle group against a given resistance over a period of time	Push-ups, Sit-ups, for 12+ repetitions
Flexibility	The range of motion around any given joint.	Static Stretching, Dynamic Stretching, Yoga, Pilates
Body Composition	The body's ratio of fat mass to lean mass (muscle).	Senior Leader Sustainment Program provides BIA[3]

[1]High intensity interval training; [2]High intensity functional training; [3]Bioelectric impedance analysis (BIA) measures body composition through rate of electrical current traveling through body.

Overload and progression, two of the principles of training listed in Figure 3, are critical components in designing a training program. Overload is accomplished by increasing demands placed on the body during a single training session to stimulate a desired physiological adaptation. For example, adding an extra set, completing more repetitions, or increasing the training weight can all be used to increase the demand on the body. Progression builds upon the overload principle and refers to gradually increasing physical stressors on the muscular or cardiovascular system over a period of time to promote physiological adaptation, enabling the body to become stronger, faster, or more flexible over time.[45] Developing a fitness training program should include deliberate, incremental increases in workload (overload) applied over a period of time (progression) to achieve individual long-term goals.

Overload and progression are included in a training program by applying the F.I.T.T. principle (Frequency; Intensity; Time; Type - see Figure 5) to assist individuals design a training program tailored to available time, fitness level, and overall training goal. Frequency refers to how often an

44. Laura Williams, "5 Health-related Components of Fitness," Verywell Fit, last updated November 4, 2022, https://www.verywellfit.com/the-components-of-fitness-4154074.

45. Michael I. Lambert et al., "General Principles of Training," in *The Olympic Textbook of Medicine in Sport,* ed. Martin P. Schwellnus, (Hoboken, NJ: Wiley-Blackwell, 2009), 14, https://doi.org/10.1002/9781444300635.ch1.

individual performs muscular strength, endurance, or cardiovascular training. Intensity can be measured by the percentage of maximum heart rate or the rate of perceived exertion (RPE) and refers to the level of physical difficulty experienced during the "work" phase of the training session.[46] Time or the duration of physical activity can vary depending upon exercise intensity. For example, high intensity exercise requires less time to achieve the desired training effect compared to the same exercise conducted at a lower intensity. Finally, type refers to the type of muscular strength and endurance, cardiovascular work capacity, and/or flexibility training completed. Incorporating these training principles into an exercise program sets the conditions to achieve desired fitness improvements while reducing potential overuse and acute injury.

Figure 5. F.I.T.T. Example Using Health and Human Services Physical Activity Guidelines

	Frequency	Intensity	Time	Type
Aerobic Exercise	5 days/ week	Moderate (150 min/wk)	30 minutes	Tabata Bike 30:60s Hill Repeats 500-meter Row
	3 days/ week	Vigorous (75 min/wk)	25 minutes	
Muscular Strength and Endurance	2+ days/ week	Moderate to High	20-30 minutes	Full Body HIIT[1] or HIFT[2] Session
Flexibility	2-7 days/ week	Moderate	10 – 15 minutes	Dynamic, Static, PNF, Yoga

[1]High intensity interval training, [2]High intensity functional training.

Exercise Duration and Intensity

The Department of Health and Human Services *Physical Activity Guidelines for Americans* recommends moderate and vigorous intensity exercise that includes both cardiovascular and muscular strength training sessions. However, moderate intensity, steady state physical activity may not be the most ideal for achieving optimal performance. The subsequent sections examine moderate intensity continuous training compared to high intensity interval training (HIIT) and high intensity functional training (HIFT). While moderate and vigorous intensity exercises provide health benefits, HIIT and HIFT provide time and performance benefits not attained by moderate intensity continuous training (MICT).

46. *FM 7-22 Holistic Health and Fitness* has additional information for calculating maximum heart rate and RPE (see Chapter 6).

For several decades, MICT has been the principal method of physical training and emphasizes extended periods of continuous exercise at a moderate intensity to achieve desired physical conditioning goals.[47] A typical MICT training session might include walking on a treadmill at a comfortable pace, running three miles at a sustained speed, or doing three sets of ten repetitions on the bench press using moderately heavyweight (60-75% maximum effort). Historically, MICT has served as the foundation of the United States Army's physical training program because it is simple, inexpensive, and can be performed by large groups with little or no formal training in almost any environmental condition.[48]

Although MICT can improve health outcomes, there are a few drawbacks that make it a challenge for senior leaders. First, MICT exercise sessions typically take 45 minutes or longer to complete, depending upon the cardiovascular or muscular strength and endurance training session. As noted throughout this book, senior leaders have competing demands that make it difficult to consistently dedicate 45 minutes or more to physical training sessions. Second, the most common overuse injuries are typically attributed to improper training characterized by repetitive physical activity that the body is not prepared to perform.[49] These injuries are primarily linked to running and include the typical overuse injuries such as, runner's knee, stress fractures, tendonitis, and plantar fasciitis. Moreover, 66% of soldiers 45 years old and older account for most overuse injuries.[50]

In contrast, high intensity interval training (HIIT) and high intensity functional training (HIFT) emphasize low volume training characterized by periods of high-intensity exercise that elevate the heart rate to 80-95% of the target maximum heart rate followed by brief periods, if any, of lower intensity exercise or rest periods.[51] Recent research has demonstrated the value of HIIT on health indicators, finding that HIIT resulted in equivalent health improvements as MICT despite large variances in total exercise time requirements.[52]

47. Martin J. Gibala, Patrick J. Gagnon, and Bradley C. Nindl, "Military Applicability of Interval Training for Health and Performance," *Journal of Strength and Conditioning Research* 29 (2015): S40–45, https://doi.org/10.1519/JSC.0000000000001119.

48. Gibala, Gagnon, and Nindl, S40.

49. Mayo Clinic, "Overuse Injury: How to Prevent Training Injuries," Healthy Lifestyle Fitness, March 10, 2021, https://www.mayoclinic.org/healthy-lifestyle/fitness/in-depth/overuse-injury/art-20045875.

50. Southeast Orthopedic Specialists, "Common Overuse Injuries," *Southeast Orthopedic Blog*, accessed February 12, 2023, https://se-ortho.com/common-overuse-injuries/.

51. MacInnis and Gibala, 2916.

52. Shigenori Ito, "High-Intensity Interval Training for Health Benefits and Care of Cardiac Diseases - The Key to an Efficient Exercise Protocol," *World Journal of Cardiology* 11, no. 7 (2019): 171–88, https://doi.org/10.4330/wjc.v11.i7.171.

Figure 6. Comparison Between Exercise Duration and Intensity

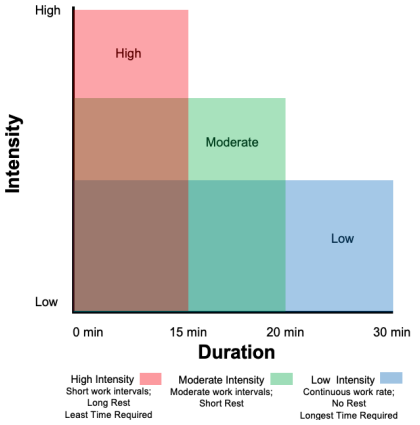


Figure 6 depicts the relationship between exercise time and intensity during a single training session. An advantage of HIIT sessions is that exercise intensity, recovery period, and the number of iterations can be tailored to individual fitness levels. The F.I.T.T. principles should be applied when developing any exercise program and should align with overload and progression training principles. See Figure 7 for examples of HIIT training options that can be used to establish an effective aerobic fitness training program.

Figure 7. HIIT Workout Examples[53]

Event	Work/Rest	Iterations	Time Required	Benefits
Tabata[1]	20/10 sec.	8	4 Minutes	Increase cardiovascular work capacity; increased calorie burn short timeframe
30:60s/ 60:120s	30/60 sec. 60/120 sec.	8-15/ 6-10	12-23 Minutes/ 18-30 Minutes	Improve cardiovascular work capacity; Anaerobic Endurance
Hill Repeats	20-30 sec/ 120 sec rest	5-10	12-25 Minutes	Explosive leg strength; Anaerobic Endurance; speed
Sprints	30/30 sec	8-10	8-10 minutes	Increase work capacity; power, speed, Anaerobic Endurance
Intervals	200m/90 sec	8-10	24-30 Minutes	Speed, Anaerobic Endurance
Intervals	400m/3 min	6-8	26-34 Minutes	

[1]Tabata – Type of High Intensity Interval Training protocol comprised of 6-8 "exhaustive" intervals of 20 seconds maximum effort followed by 10 seconds rest.[54] (Alternate Exercises: Bike: 90-110 rpm for time; Rower: 250m or 500m; Elliptical: 400m; Swim: 50-100m) Adapted in part from FM 7-22 (Chapter 6).

As an alternative to HIIT, moderate intensity interval training (MIIT) may help prepare physically inactive or untrained populations and individuals recovering from injury for more intense physical activity. Although MIIT resembles HIIT, the target heart rate is reduced to 55-75% of maximum heart rate and the number of intervals is increased to achieve the same physiological adaptation. Naturally, the reduced relative intensity requires the total exercise volume and training time to increase to achieve the same training effect as HIIT.[55] Of relevance to military physical training, HIIT and MIIT are practical for large groups of any fitness level, age, and sex.[56]

Many studies have evaluated the effectiveness of HIIT programs on metabolic and cardiorespiratory fitness. Training programs that include

53. Headquarters, Department of the Army, *FM 7-22 Holistic Health and Fitness,* (Washington, DC: Department of the Army, October 8,2020), 6-5, https://armypubs.army.mil/epubs/DR_pubs/DR_a/ARN30964-FM_7-22-001-WEB-4.pdf.

54. Izumi Tabata, "Tabata Training: One of the Most Energetically Effective High-Intensity Intermittent Training Methods," *The Journal of Physiological Sciences* 69, no. 4 (2019): 566, https://doi.org/10.1007/s12576-019-00676-7.

55. Gibala, Gagnon, and Nindl, S40.

56. Gibala, Gagnon, and Nindl, S43.

HIFT result in similar improvements in cardiorespiratory fitness. However, gains in muscular strength and lean body mass were significantly greater with HIFT compared to HIIT and MICT training.[57] Consequently, HIFT is an attractive way to meet fitness goals while reducing overuse injuries and time commitment.[58] Specifically, HIFT incorporates HIIT in low volume and emphasizes "functional, multi-joint movements that include aerobic and muscular strengthening exercises."[59] It can be tailored to any fitness level and stimulates greater muscle recruitment than traditional steady state cardiovascular endurance and muscular strength and endurance exercises. The objective of HIFT is to elicit physiological adaptation across multiple predetermined health (muscular strength and endurance, aerobic fitness, flexibility, and mobility) and skill (agility, coordination, speed, and power) related components of fitness.[60] Figure 8 provides definitions and examples for the skill components of fitness.

Figure 8. Skill Components of Fitness[61]

Component	Definition	Example
Agility	Ability to change direction quickly and/or adjust body position vertically or laterally.	Shuttle run; cone drills; agility ladders
Coordination	Efficiency of integrating and synchronizing the body's movement in space; includes visual alignment such as hand-eye coordination.	Squats, jump rope; sports, yoga, agility ladder drills
Power	The ability to generate maximal force.	Box jumps, standing power throw; medicine ball slams; clean; snatch
Speed	The rate at which a person or covers distance. Involves 95 -100% to effort. Develops both aerobic and anerobic systems.	50m Sprint (The sprint segment of the Sprint Drag Carry); intervals; hill repeats
Reaction Time	Cognitive time to process an external stimulus occurring and the physical response.	Directional drills using cones with voice commands, "forward," "back," "left," "right."
Balance	Your ability to adjust your body position to remain upright.	Standing yoga poses, BOSU ball workouts, using balance discs to perform exercises.

57. Yuri Feito et al., "High-Intensity Functional Training (HIFT): Definition and Research Implications for Improved Fitness," *Sports* 6, no. 3 (2018): 76, https://doi.org/10.3390/sports6030076.

58. Wayne W. Campbell, et al., "High-Intensity Interval Training for Cardiometabolic Disease Prevention," *Medicine & Science in Sports & Exercise,* 51, no. 6, (2019): 1220-26, https://doi.org/10.1249/MSS.0000000000001934.

59. Feito et al., 2.

60. Feito et al., 13.

61. Laura Williams, "What Are the 6 Skill-Related Fitness Components?," Verywell Fit, last updated September 16, 2022, https://www.verywellfit.com/skill-related-fitness-components-4155209

Most HIFT programs seek to improve cardiovascular work capacity through the integration of a variety of "bodyweight exercises (push-ups, sit-ups, pull-ups, air squats, etc.), weighted lifts (deadlifts, squats, goblet squats, kettlebell swings, push press, etc.), and aerobic fitness exercises (see Figure 9 for examples of HIFT sessions)."[62] HIFT workouts are designed to be completed in the fastest time possible or by completing a series of exercises within a given time frame for *As Many Repetitions/Rotations As Possible* (AMRAP).[63] Rest time, although not always necessary, can be programmed to follow each series of exercises or can be taken "as needed" throughout the training session.[64] A properly designed HIFT program should incorporate the principles of overload and progression, the F.I.T.T. principles, along with injury prevention measures, and adequate recovery time between training sessions.[65]

Military personnel can benefit from HIFT in numerous ways. First, HIFT workouts can be completed "in a fraction of the time required" for traditional Army physical training sessions without sacrificing health and fitness.[66] Second, HIFT sessions can be conducted in austere environments using bodyweight or everyday items used during military operations (i.e., tires, sandbags, water jugs, duffle bags, etc.). Third, HIFT workouts offer a variety of options that prevent boredom and increase overall enjoyment. Finally, HIFT sessions can be scaled to individual fitness levels and can be modified to accommodate injuries.[67] By simply adjusting the exercise mode—bike, elliptical, rower, or stair climber—individuals can continue to work towards their fitness goals.

62. Christopher K. Haddock et al., "The Benefits of High-Intensity Functional Training Fitness Programs for Military Personnel," *Military Medicine* 181, no. 11 (2016): e1510. https://doi.org/10.7205/MILMED-D-15-00503; Feito et al., 8.
63. Feito et al., 3.
64. Feito et al., 5.
65. Haddock et al., 5.
66. Haddock et al., 2.
67. Haddock et al., 5.

Figure 9. Example HIFT Training Sessions

Workout		Time/ Rotations	Exercise	Time	Notes
1	Tabata	4 Minutes (AMRAP) 20 seconds work; 10 seconds rest;	Kettlebell Swings (KBs) Push-Ups Sit-Ups Air Squats Sprints – Bike/Run/ Elliptical	25 min	Rest - 1 minute between tabata iterations
2	Power	4-5 Rotations	5 Box/Tire Jumps 3-5 Clapping Pushups 5 Medicine Ball Slams 10 KB Swings 30 Sec Bike Sprint[1] (90-second rest)	25 Min	[1]Can substitute elliptical or rower (250 meters) in place of bike
3	Legs	4-5 Rotations	60 Sec Spin Bike[2] 30 Air Squats 10 Power Jumps 10 KB Swings (60-second rest)	20-25 Min	[2]Moderate to heavy tension on spin bike (90-110 RPM)
4	Full Body	24 Minutes (As Many Rotations as Possible)	20 Air Squats 3-5 Pull Ups[3] 10 Hand Release Push-ups 8-10 V-Ups	24 Min	[3]Use bands to assist with pull-ups if unable to do unassisted repetitions.
5	Full Body 2	3-5 Rotations	Push Ups[4] 20-30 Air Squat 20-35 Sit Ups 10-20 KB Swings High Intensity Cardio[5] Rest 2 Minutes	24-40 Min	[4]Use 1/2 ACFT Hand Release Push Up score. [5]Run/Elliptical 400m; Row 500m; or Bike 30 Seconds at Moderate to Heavy Tension
6	Hypertrophy	Circuit (10, 8, 6, 6, 6 Repetitions)	Plate Loaded Push Ups Leg Tucks[6] Goblet Squats Pull-ups[7] Rest 60 Seconds	24 Min	[7]Add weight if able to exceed programmed repetitions; Use bands to assist with pull-ups if unable to do unassisted repetitions.
7	100s	Do 100 Reps in as few sets as possible	Push-Ups Air Squats Crunches KB Swings Dumbbell Curls Triceps Press downs	15-20 Min	[8]First set AMRAP-Target repetitions can be scaled down or up to individual's fitness level (50;75;125)
8	Strength	4-5 Sets [9]3-6 Repetitions 90 -120 seconds Rest	Squats Bench Press/Push Press Deadlifts	30-40 Minutes	[9]Strict form should be followed over increased weight. If proper form is not achieved reduce weight to allow for proper form.

Flexibility

Flexibility is another of the five health-related components of fitness and refers to the level of elasticity in a single muscle or group of muscles.[68] As people age, the range of motion in their lower extremities progressively declines.[69] Unfortunately, many people ignore the importance of flexibility in preventing injury and maintaining functional fitness across the lifespan. Flexibility exercises should be conducted at least two times per week for at least ten minutes and can be incorporated into the daily training session to save time.[70] Additionally, participating in physical fitness activities requiring major joints to move through their full range of motion can preserve flexibility.[71]

Static and dynamic stretching are two common stretching modalities. Dynamic stretches should be completed before exercise and include controlled movements that prepare muscles, ligaments, and other soft tissue for more explosive activities. On the other hand, static stretches involve holding a single position for a specified period and can be conducted independently, during, or after a training session.[72]

Proprioceptive neuromuscular facilitation (PNF) and yoga are two examples of static stretching. PNF training is a form of partner-assisted static stretching that provides the most significant increases in flexibility and range of motion.[73] Three different techniques focus on applying a combination of passive stretching techniques with isometric contractions to elicit deeper stretches than otherwise achieved with regular static stretching. Go to *PNF Stretching: A How-To Guide,* by Kristen Barta, to find more information on how to properly conduct PNF.[74] Yoga combines the benefits of focused breathing techniques, meditation, and flowing through sequential poses that stretch and flex various muscle groups.[75] Yoga has gained popularity in the past several years and provides a challenging yet enjoyable way to improve flexibility, strength, and reduce stress. Lastly, *FM 7-22 Holistic Health and Fitness* offers effective preparatory (dynamic) and recovery drills (static) that can be incorporated into any physical fitness program to improve flexibility and reduce the potential for injury.[76]

68. Wojtek J. Chodzko-Zajko et al., "American College of Sports Medicine Position Stand: Exercise and Physical Activity for Older Adults," *Medicine & Science in Sports & Exercise* 41, no. 7 (2009): 1511, https://doi.org/10.1249/MSS.0b013e3181a0c95c.

69. Adams, O'Shea, and O'Shea, 70.

70. U.S. Department of Health and Human Services, "Physical Activity Guidelines for Americans," 61.

71. Adams, O'Shea, and O'Shea, 70.

72. Leigh-Ann Bramble, "Static vs. Dynamic Stretching: What Are They and Which Should You Do?," April 19, 2021, https://www.hss.edu/conditions_dynamic-static-stretching.asp.

73. Barta Kristen, "PNF Stretching: A How-To Guide," Healthline, last updated July 9, 2017, https://www.healthline.com/health/fitness-exercise/pnf-stretching.

74. Barta.

75. American Osteopathic Association, "Benefits of Yoga," accessed February 12, 2023, https://osteopathic.org/what-is-osteopathic-medicine/benefits-of-yoga/.

76. Headquarters, Department of the Army, *FM 7-22 Holistic Health and Fitness,* 6-5.

Tying It All Together

Exercise is the foundation for achieving optimal health and performance.[77] The benefits are undeniable, immediate, and affect the body's ability to reduce the effects of stress, improve sleep, and reduce the risk of many chronic diseases and other adverse health outcomes. However, the challenge for senior leaders is that they face competing priorities that often detract from their long-term health and fitness goals. They work long hours, get limited sleep, and experience extended periods of unhealthy stress, all of which have detrimental impacts on the quality and quantity of life across the lifespan.

Soren Brage, an epidemiologist from Cambridge University, aptly stated in a recently published study that, "irrespective of our current life circumstances, it is never too late to build physical activity into your daily routine to enjoy a longer, healthier life."[78] Understanding that time is a limited commodity, prioritizing exercise is an important behavioral decision that senior leaders must make to realize the health benefits and reduce the risk for preventable chronic disease. Therefore, an exercise program that incorporates moderate to high-intensity cardiovascular exercise, functional resistance training, and flexibility training is a time-efficient training mode for all ages and fitness levels (see Figure 10 for a sample training plan). This makes high intensity training an ideal exercise solution for senior leaders to achieve optimal health and performance.

77. Newsom, 1.

78. Lisa Rapaport, "Maintaining or Starting Exercise in Middle Age Tied to Longer Life," Reuters, July 17, 2019, https://www.reuters.com/article/us-health-fitness-middle-agemaintaining-or-starting-exercise-in-middle-age-tied-to-longer-life-idUSKCN1UC2E9.

Figure 10. Sample Training Program

Monday	Tuesday	Wednesday	Thursday	Friday	Weekend
30:60s 5-minute dynamic warm up *10 Iterations* 70%[1] - 1st Iteration 80% - 2nd Iteration 90% - Remaining Iterations	**5 Rotations** (10, 8, 6, 6, 6) Plate Loaded P/U Leg Tucks Goblet Sqts Pull Ups Rest 60 Sec (Static Stretch)	**Tabata** (Bike/Rower) 3 Cycles of 4 minutes; 85% effort; rest 2 minutes between cycles (Static Stretch)	**Active Recovery** Four for Core Yoga Flexibility	**Intervals** 5-minute dynamic warm up 2 x 400m 2 x 300m 2 x 200m 2 x 100m Rest = Run time x 2 (Static Stretch)	**Strength** 4 Sets of 6 85% 1 Rep Max (1RM) Squats/Leg Press Bench Press Deadlifts
AMRAP In 24 Minutes 20 Air Sqts 3 Pull Ups 10 Hand Release P/U 8 V-Ups	**30:60s** 5-minute dynamic warm up *11[2] Iterations* 70% - 1st Iteration 80% - 2nd Iteration 90% - Remaining Iterations	**Active Recovery** Four for Core Yoga Flexibility	**Hill Repeats** 5-minute dynamic warm up 7 Iterations 70% - 1st Iteration 80% - 2nd Iteration 90% - Remaining Iterations	**Reverse Tabata 10 Sec Work/ 20 Sec Rest** Sprints – Bike (Moderate Tension) Push Ups Air Squats Sit Ups Kettlebell Swings 60 secs Rest	**Recovery** (Run, Bike, Row, Elliptical) 30-40 mins Aerobic Activity 60-70% Effort
30:60s 5-minute dynamic warm up *12 Iterations* 70% - 1st Iteration 80% - 2nd Iteration 90% - Remaining Iterations	**5 Rotations** **< Increase Weight by 5-10lbs for set 3- 5 >** (10, 8, 6, 6, 6) Plate Loaded P/U Leg Tucks Goblet Sqts Pull Ups Rest 60 Sec (Static Stretch)	**Tabata** (Bike/Rower) 3 Cycles of 4 minutes; 90% effort; rest 2 minutes between cycles (Static Stretch)	**Active Recovery** Four for Core Yoga Flexibility	**Intervals** 5-minute dynamic warm up 2 x 400m 2 x 300m 2 x 200m 3 x 100m Rest = Run time x 2 (Static Stretch)	**Strength** 4 Sets of 6 85% 1 Rep Max (1RM) Squats/Leg Press Bench Press Deadlifts
Reverse Tabata 10 Sec Work/ 20 Sec Rest Sprints – Bike (Heavy Tension) Push Ups Air Squats Sit Ups Kettlebell Swings 60 Secs Rest	**30:60s** 5-minute dynamic warm up *10 Iterations* 70% - 1st Iteration 85% - 2nd Iteration 95%[3] - Remaining Iterations	**Active Recovery** Four for Core Yoga Flexibility	**Hill Repeats** 5-minute dynamic warm up 8 Iterations 70% - 1st Iteration 80% - 2nd Iteration 90% - Remaining Iterations	**AMRAP** In 24 Minutes 20 Air Sqts 3 Pull Ups 10 Hand Release P/U 8 V-Ups ***Goal** add 1 "rotation"	**Recovery** (Run, Bike, Row, Elliptical) 30-40 mins Aerobic Activity 60-70% Effort

Note 1. Rate of Perceived Exertion (RPE) – Numbered rating scale from 1-10 associated with exertion level. Applied to both cardiovascular and strength/ endurance activities.

(Moderate = 6; Vigorous = 7-8; High Intensity = 9; Maximum Effort = 10)

Note 2. A way to apply the Overload Principle - Add 1 iteration to second 30:60 training session.

Note 3. Reduce number of iterations back to 10 and increase effort to near maximum.

Key Takeaways

- Routine exercise has been shown to delay the onset of age-related physical changes and the body's natural loss of muscle mass and bone density.
- Senior leaders should balance work demands with healthy life choices that include regular physical activity of sufficient duration, intensity, and frequency.
- Participating in physical fitness activities that require major joints to move through their full range of motion can preserve flexibility and mobility.
- A benefit of participating in high intensity interval training (HIIT) and high intensity functional training (HIFT) sessions is that exercise intensity, rest duration, and the number of cycles can be tailored to individual fitness levels.
- HIIT and HIFT offer senior leaders an attractive way to achieve optimal health and improve physical fitness while consuming less overall time per week.

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