HEALTH PLAYBOOK

NFLPA

A Message From

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On behalf of the NFL Players Association, we are pleased to present the inaugural edition of the NFLPA Health Playbook, a summary of existing clinical practice guidelines designed and written by members of our Mackey-White Health and Safety Committee. This playbook was designed to help players reach peak fitness and nutrition goals, as well as be informed of the scientific advances for specific clinical diseases and conditions.

Chapter topics were selected based on research data collected from the Football Player Health Study at Harvard University with feedback from active and current players who are members of the Mackey-White Health and Safety Committee. The playbook addresses common injuries current players may suffer and details diseases and conditions that may develop in retired players as they age.

The NFLPA is committed to assuring that our members receive the best medical care in the world. Such efforts require constant vigilance to monitor the words and actions of those providing care to our players. While significant and substantial progress has been made, our efforts are, as they must be, untiring for the good of our players as people and patients. We stand by our promise that player-patient safety, health and wellness are, and will always be, non-negotiable.

We will continue to inform you of notable news on health and safety issues and hope that you will share this information with your teammates. We hope you find this playbook helpful and that you will provide us with feedback as you read and use it.

DEMAURICE F. SMITH

ERIC WINSTON

Preface

The NFL Players Association's Mackey-White Health and Safety Committee is charged with interpreting and advancing the science related to workplace injuries arising from employment in the NFL and educating NFLPA members regarding matters pertinent to healthcare in the NFL. As a part of its work, the Committee has developed this "Health Playbook," intended to summarize existing clinical practice guidelines, as a resource for players and their families.

The NFL Players Association Health Playbook is a user-friendly guide that addresses key aspects of player health and performance. While it is designed to help educate and guide nutritional, medical, and conditioning choices, we also hope that it helps you in discussing symptoms and/or health issues with your doctor.

The playbook is divided into 4 parts:

1. Performance
2. Medical Diseases and Conditions
3. Orthopedics and Musculoskeletal Conditions
4. Neurology and Neurotrauma

Chapter subject matter was selected by Mackey-White members, based on information collected from the Football Player Health Study at Harvard, with player input in regard to particular health concerns, and each section tackles important topics impacting player health and wellness. Every chapter is written by one or more prominent scientists in the applicable field.

This Playbook will be updated regularly and made available online to current and retired NFL players. The NFL Players Association is committed to protecting your health and well-being, which is why this playbook was developed for you.

We welcome your feedback on the content of the Health Playbook, both so it will be responsive to your needs and because it will be regularly updated as the science advances.

This Health Playbook contains important information intended to educate you and stimulate conversations between you and your healthcare providers, but it is not a replacement for interactions with, and treatment by, your healthcare providers; only they can provide you with individual healthcare advice and medical care.

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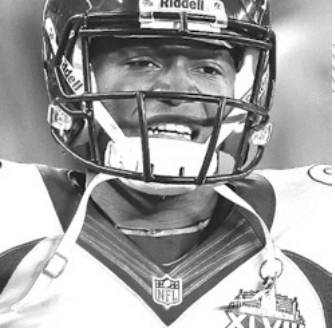
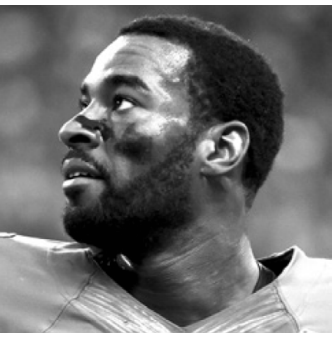
Linda Cooper was, as always, diligent and detailed in her assistance in getting this Playbook into its final form and we express our thanks and admiration.

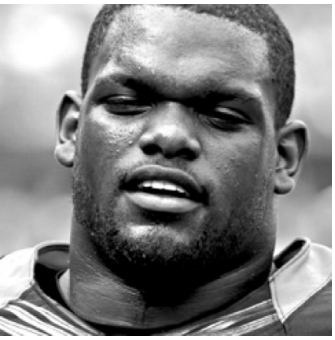
The former and current NFL players who serve on the Mackey-White Health and Safety Committee were invaluable in assuring that this work was both undertaken and focused first and foremost on the players:

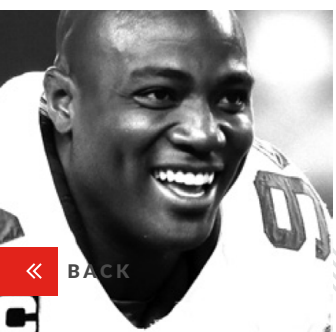
- **Lester Archambeaux**
- **Cornelius Bennett**
- **Tom Carter**
- **Zamir Cobb**
- **Austin Colley**
- **Ernie Conwell**
- **Don Davis**
- **Sean Suisham**
- **Ben Utecht**

Finally, we thank the men who have played this game and their families—their sacrifices both on and off the field are what make the National Football League great.









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Sleep & Sleep Disorders

Geoffrey Ling, MD, PhD, FAAN, FANA, *CEO, Sun-Q LLC*

Sleep plays a major role in athletic performance. This chapter provides an overview of common sleep disorders, common sleep tests, and sleep aids and treatments for improved sleep.

Why is this Important?

Sleep plays a major role in health, athletic performance and competitive results. Sleep deprivation increases fatigue, impairs judgment, impedes physical performance, significantly reduces reaction times, and increases risk of injury. The National Sleep Foundation (NSF) recommends 7 to 9 hours per night for adults. If possible, athletes preparing for a competition are recommended to increase their nightly sleep.

Common Sleep Disorders

Insomnia is a sleep disorder in which people have difficulty falling or staying asleep. Insomnia varies in how long it lasts and how often it occurs. About 50 percent of adults experience occasional bouts of insomnia and 1 in 10 suffer from chronic insomnia, which is difficulty sleeping at least three nights a week for a month or longer.

According to the National Sleep Foundation, approximately 1 in 10 adult Americans suffer from **Restless Legs Syndrome (RLS),** a sleep-related movement disorder causing an intense, often irresistible and sometimes painful, urge to move the legs. RLS typically occurs in the evening, making it difficult to fall asleep and stay asleep. It can be associated with problems with daytime sleepiness, irritability, and concentration.

Sleep apnea is a common disorder where there are one or more pauses in breathing, slowed breathing, or shallow breaths during sleep, which reduces the quality of sleep and results in daytime sleepiness. There are two types of sleep apnea: obstructive sleep apnea, caused by a blockage of the airway, and central sleep apnea, where the brain fails to tell the body to breathe.

Narcolepsy is extreme daytime sleepiness and sudden, irresistible bouts of sleep during the day. These sudden sleep attacks may occur during any type of activity and at any time of the day.

Circadian rhythm sleep disorder is a problem with the "normal" sleep-wake cycle that makes it difficult to experience a restorative pattern of sleep. Versions of this disorder include shift work sleep disorder and jet lag.

In many of these sleep disorders, there can be a genetic component.

SUMMARY POINTS

7 to 9 hours of sleep per night is recommended for adults

Insomnia, Restless Legs Syndrome (RLS), sleep apnea, narcolepsy, and circadian rhythm sleep disorder are **common sleep disorders**

Sleep study specialists are **typically neurology or pulmonary physicians** with special training in sleep disorders

There are several types of **non-invasive, painless sleep studies**

Both **non-drug therapies** and **drug therapies** exist to improve sleep

Sleep Testing (Diagnosis)

Primary care medical providers may refer you to a sleep specialist after initial history, assessment of sleep hygiene, and screening test using the Epworth Sleepiness Scale (ESS), which provides a general level of daytime sleepiness. Sleep specialists are typically neurology or pulmonary physicians who have special training in sleep disorders and ideally will be board certified by the American Board of Sleep Medicine. As part of their evaluation, they often will conduct a sleep study.

There are several types of sleep studies:

Polysomnogram: For a polysomnogram (PSG) study, small pads or patches (electrodes) are placed on the head and body with a small amount of adhesive and tape. The electrodes record brain activity, eye movement, oxygen and carbon dioxide blood levels, heart rate and rhythm, breathing rate and rhythm, air flow through the mouth and nose, snoring, body muscle movements, and chest and belly movement. Soft elastic belts are placed around the chest and belly to measure breathing. A small clip (oximeter) placed on the tip of the index finger measures blood oxygen levels. The PSG is a comprehensive test that can diagnose sleep apnea, restless leg syndrome, sleep behavior, and many other conditions. Your physician can also use the results to help determine the best therapy you need and to adjust that therapy specifically for you.

Multiple sleep latency test (MSLT): Also known as a daytime nap study, this procedure tests for excessive daytime sleepiness by measuring how long it takes to fall asleep. It also determines whether you enter REM (Rapid Eye Movement) sleep, which is the dreaming stage of sleep. The test consists of five scheduled naps separated by two-hour breaks. The MSLT is the standard tool used to diagnose narcolepsy, extreme daytime sleepiness and sudden, irresistible bouts of sleep, and hypersomnia, daytime sleepiness despite extended nighttime sleep amounts (e.g., > 10 hours per night).

Maintenance of wakefulness test (MWT): This test measures whether you can stay awake during a time when you are normally awake. The MWT consists of four sleep trials with breaks in between. Sensors are placed on the head, face, and chin. They send tiny electrical signals to a computer, which show when you are asleep and awake during the test.

Study Results: Sleep study results are generally available within 1 to 2 weeks. For a polysomnogram, reduced or blocked air flow to the lungs that occurs more than 5 times in 1 hour may mean sleep apnea. For a multiple sleep latency test, taking an average of 5 to 10 minutes to fall asleep means mild to moderate daytime sleepiness, an average of less than 5 minutes to fall asleep means severe daytime sleepiness, and an average of less than 8 minutes to fall sleep along with 2 or more rapid eye movements (REM) during 5 to 6 naps may mean narcolepsy. For the maintenance of wakefulness test, falling asleep in less than 40 minutes is considered abnormal, and indicates severe daytime sleepiness.

Epworth Sleepiness Scale

The Epworth Sleepiness Scale (ESS) is a self-administered questionnaire where respondents are asked to rate their usual chances of dozing off or falling asleep while performing different activities. See the **Additional Patient Resources** section at the end of this chapter for more information.

Sleep Aids and Treatments

Non-drug therapies: Improving sleep habits by setting and sticking to consistent bedtimes and wake-up times, daytime moderate-intensity exercise, reducing the use of caffeine and alcohol, sleeping in a quiet and dark bedroom, not watching TV or using computers in bed, relaxation therapy (tensing and relaxing different muscle groups), meditation, and using the bed only for sleep and sex; all naturally help improve the quality and duration of sleep.

CPAP

For patients with sleep apnea, continuous positive airway pressure (CPAP) therapy is the primary treatment. CPAP therapy keeps the airway open by gently delivering a constant stream of air through a mask worn over the nose or nose and mouth.

OTC (over the counter non-prescription) therapies:

Antihistamines such as Benadryl, Unisom and Nytol have been used as sleep aids, however, they are only minimally effective in inducing sleep, may reduce sleep quality, and can cause residual drowsiness.

Melatonin is a bodily hormone that regulates night and day cycles or sleep-wake cycles. Darkness causes the body to produce more melatonin, which signals the body to prepare for sleep. Light, particularly "blue light" such as the light from computers, televisions, smartphones, and tablets, decreases melatonin production and signals the body to prepare for being awake. Many phones and other screen devices allow the user to switch the device to a non-blue light mode, which should minimize this effect. Melatonin in supplement (pill) form is used as a sleep aid.

Valerian is an herb used to treat insomnia. Continuous use for several days, even up to four weeks, may be needed before an effect is noticeable.

Chamomile tea acts as a mild calming sedative.

Drug therapies

Lunesta (eszopiclone) is a prescription-only sleep aid approved to both help you fall asleep and to help you stay asleep. The US Food and Drug Administration (FDA) has decreased the recommended starting dose of Lunesta at bedtime after reports that Lunesta can cause next-day impairment of driving and other activities that require alertness.

Ambien (zolpidem) is a sedative, also called a hypnotic. The immediate-release tablet is used to help you fall asleep. The extended-release form, Ambien CR, has a second layer that dissolves slowly to help you stay asleep. Ambien may impair thinking or reactions, and may cause daytime sleepiness.

Sonata (zaleplon) is a hypnotic used to help you fall asleep. It stays active in the body for the shortest amount of time.
Older sleeping pills such as Halcion (triazolam), Xanax (alprazolam), and others stay in the body longer and may cause dependence.

Under no circumstances should alcohol be consumed when taking sleep medications. The combined effect of alcohol and these drugs can impair breathing and lead to death.

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Sleep Tests: What They Diagnose

Sleep Test	Sleep Disorder Diagnosed
Polysomnogram (PSG)	Sleep Apnea Restless Leg Syndrome Narcolepsy Other Conditions
Multiple Latency Test	Narcolepsy Extreme Daytime Sleepiness Hypersomnia
Maintenance of Wakefulness	Daytime Alertness

ADDITIONAL PATIENT RESOURCES

National Sleep Foundation

The Stanford Center for Sleep Sciences and Medicine

Sleep Deprivation and Deficiency (National Heart, Lung, and Blood Institute)

Sleeping Tips & Tricks

Sleep Calculator

Brain Basics: Understanding Sleep

Epworth Sleepiness Scale

PERFORMANCE

Mental Health and Performance

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Although professional athletes have high stress levels, which result in potential mental health issues, many athletes do not seek out mental health care. This chapter provides an overview of common mental health issues, symptoms of mental health issues, and treatment options.

Why is this Important?

Too often, athletes focus only on physical enhancement, unaware of the impact of other areas of health, particularly mental health. A clear connection exists between mental health and athletic performance and while some mental health conditions can result from the desire or effort to improve performance, others may stem from the stressors of daily life or genetics. Unfortunately, in the athletic world, a focus on mental health is often considered a weakness. The stigma associated with concerns like depression, anxiety, or substance use and abuse prevents athletes from seeking the support they need, which could increase their chances for success both on the field and in life.

Stress

Few professions offer the same level of stress as that experienced by professional athletes and their families. The world of professional sports is one in which career survival and success is based almost exclusively on performance, with limited guarantees for job security. Add to that the level of scrutiny that accompanies a job in the public eye, where successes and failures, both personally and professionally, are broadcast for all to see. While some may see the job of the professional athlete as one of luxury and enjoyment, the level of stress that accompanies the profession is rarely acknowledged. These athletes perform in front of tens of thousands of spectators and millions more on TV.

Yet, not all stress is bad, as Dr. Hans Selye noted in his original work on the subject. While "stress" is interpreted as bad by most people, Selye noted that there is good stress ("eustress"), which is positive, motivational stress that drives us to higher performance (e.g., working harder than anyone else in high school, being recruited to college, moving up the depth chart, getting drafted, moving to your team city, getting married, driving yourself through training and conditioning to higher performance) and negative experiences (e.g., experiencing a loss or death in the family, financial challenges, illness, dropping down in the depth chart, getting traded).

SUMMARY POINTS

Mental health and athletic performance are **clearly connected**

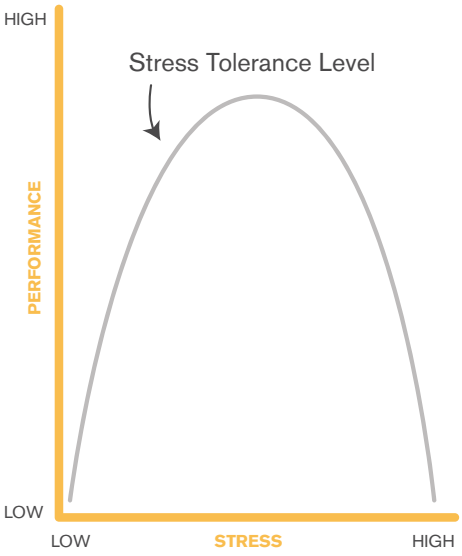
The stigma surrounding mental health prevents some athletes from seeking help

Less than half of the people who suffer from depression **seek or get help**

There are many types of successful treatments for mental health concerns, **including individual therapy, group therapy, and medications**

Your stress response is a result of your perception of the experience and your ability to cope with it. Though stress is a normal part of life, too much stress can result in damage to the memory center of your brain as well as depression, anxiety, and substance use disorders. Selye called this "distress" or bad stress, which can result in a disconnect with the level of stress experienced and an inability to effectively cope with it in positive ways.

Figure 1



To summarize, not all stress is bad, since eustress drives us to do more to improve performance. As Figure 1 shows, as good stress rises, performance improves. It is only when the ability to deal with stress reaches the "Stress Tolerance Level" (STL) that stress tumbles down the curve to distress or bad stress. Recognizing the signs of when you are approaching the STL, either by yourself or with the help of your teammates, friends, and family is critical to dealing successfully with stress. Strategies to deal with reaching the STL vary by individual, but are summarized in "Mental Health Treatments" on the following pages.

Common Mental Health Concerns

Depression: Depression is more common than most people realize, with about 16% of the population meeting the criteria for depression at some point in their lives. While most of us are familiar with the signs and symptoms of depression, less than half of the people who suffer from depression get help. It can be hard to separate "normal" feelings of sadness from depression, and because not everyone experiences symptoms of depression in the same way, it may be easy to miss signs of depression in those we care for, or even ourselves. There are many causes of depression, including a chemical imbalance in the brain, stress, trauma, loss, chronic pain, physical illness, and even lack of sleep. It is important to keep in mind that whatever the cause, depression can be treated.

Anxiety Disorders: Anxiety is the most commonly diagnosed mental health concern, with about 25% of the population meeting criteria for an anxiety disorder. Anxiety, like stress (eustress), can be helpful. For example, it's often your level of anxiety that provides the needed "adrenaline rush" for competition, or produces the motivation and momentum required to accomplish tasks, particularly the need to train well to improve or sustain levels of performance. While anxiety is something that everyone experiences, when it occurs too frequently, is too easily triggered, rises to unhealthy levels, or lasts too long, it becomes problematic. There is a long list of anxiety disorders including generalized anxiety disorder, phobias, and obsessive-compulsive disorder. Regardless of the specific diagnosis, all anxiety disorders are marked by negative emotions, symptoms of tension, and an apprehension of future danger or misfortune.

Post-traumatic Stress: PTS (Post-traumatic Stress) results from exposure to extreme or dramatic mental, physical, psychological, or spiritual trauma. While it is commonly referred to as a disorder (called PTSD), more recent literature supports the concept that, far from being a disorder, PTS is a natural and expected reaction to extreme stress. While the most common traumatic events that result in PTS include war, natural disasters, major life disruptions, the death of a family member, and rape, recent research has found that PTS symptoms are more common in certain populations than initially thought. For example, individuals from low socioeconomic, high crime, and urban environments have been found to have higher rates of PTS. Symptoms of PTS include an easily triggered startle response, flashbacks, difficulty sleeping, emotional distance, and increased, unexplained anger. Dismissing this pattern of behavior as "anger issues" or being "high strung," particularly in men, is a mistake. On average, studies suggest that it takes most people between three to five years of suffering symptoms before they seek treatment—for those used to just "dealing with" difficult emotions, it may take even longer.

After a high stress event, such as unexpected setbacks in your career, think of the possibility of PTS when any or all symptoms mentioned above occur. Remember, it is not a disorder, but rather a normal response to extreme, dramatic or prolonged stress and it can be treated and dealt with effectively.

Alcohol and Substance Abuse: US statistics document that about 10% of the population meets criteria for a substance use disorder. Those numbers

peak around mid-twenties and tend to decrease with age. For many individuals, substance use disorder accompanies other mental health concerns, and men in particular may use substances as a method of coping with emotional discomfort or distress. The frequent recreational use of substances in social settings, particularly at the college level and in sporting environments can present a challenge to identifying someone who may be struggling in this area. Alcohol, stimulants, and marijuana are often the substances used in highest percentage; however, we have seen a significant increase in opioid and heroin use disorders.

Athletic Identity/Transition:
One important aspect of the player experience that does not receive much attention is that of athletic identity and the challenges often experienced as one transitions out of sport at a highly competitive level. Athletic identity is exactly what it sounds like – the degree to which one identifies with their sport and who they are as an athlete. There are only approximately 24,000 men in history who have played in the NFL, and you are one of them! It makes sense that most professional athletes are often singularly focused on sports and see themselves first and foremost as an athlete. Given that only about 1.6% of college football players make it to the NFL, it would appear essential for players to focus on their athletic careers, sometimes to the detriment of developing other aspects of themselves.

While this singular focus can be helpful on the field, there is also considerable cost to this focused identity as a professional athlete. For example, athletes with high athletic identity are more likely to utilize banned substances to improve performance, struggle more when suffering an injury, and have a harder time transitioning out of sport. It is not uncommon to feel lost and without clear direction for a **post-career transition**, and the degree of distress often depends on family support, preparation, financial resources, and development of other aspects of identity during their football career. Failure to address the risks surrounding athletic identity can result in some of the mental health concerns addressed earlier.

DIAGNOSING MENTAL HEALTH CONCERNS (SIGNS AND SYMPTOMS)

Depression
Men may exhibit symptoms of depression differently than women. Depression can have emotional, motivational, behavioral, cognitive, and/or physical symptoms. Unexplained, sustained irritability is one of the earliest symptoms in men.

- **Decreased interest or pleasure in activities,** particularly those activities that were enjoyable in the past.
- **Feeling hopeless, irritable, anxious, or angry.**
- **Sleeping too little or too much.** Having trouble falling or staying asleep or finding that you are using sleep as an "escape" can both be indications of depressive symptoms.
- **Fatigue or loss of energy,** which contributes to decreased activity and productivity.
- **Aches or pains, headaches, or digestive problems** are physical symptoms of stress, and are often easier to discuss than psychological symptoms.
- **Feelings of worthlessness or excessive guilt.** Some people struggling with depression may ruminate, replaying mistakes they have made in the past, or think that they don't deserve to feel better.
- **Diminished ability to think or concentrate, indecisiveness.** Someone may find themselves confused or unable to remember things. Many people struggling with depression find they are easily distracted and unable to solve what they would consider the smallest of problems.
- **Recurrent thoughts of death.**

Anxiety Disorders

Signs and symptoms of anxiety disorders vary, depending on the specific disorder. However, most anxiety disorders share some typical symptoms, including cognitive (thought based), emotional, and physical symptoms.

Physical and physiological symptoms: Rapid heartbeat, shortness of breath, sweaty palms, dry mouth, muscle tension, and chronic gas or indigestion.

Behavioral and emotional symptoms: Difficulty sleeping, feelings of panic, general uneasiness, and a sense of dread.

Cognitive symptoms: Excessive worry, rumination, difficulty focusing or concentrating, irrational fear, and self-doubt.

Mental Health Treatments

There are many types of treatments for mental health concerns. The most common form of treatment is Cognitive Behavioral Therapy (CBT). CBT focuses on helping people better understand how their thoughts are connected to their emotions and behaviors. By recognizing the link between your thinking patterns and your actions and working to change them, CBT has been proven to help decrease symptoms of depression and anxiety.

At times, medication management may also be an important part of the treatment process. Common misconceptions about medication can cause concerns for some, but it's important to recognize that while medication can often be an effective part of the treatment process, it is not typically something that you must do forever. A good psychiatrist will help ensure that a person is prescribed the type of medication and the dosage that is most effective for them only when medication is truly needed, and ensure that medication is not the only form of treatment. A combination of medication and counseling is often considered the most effective treatment for mental health concerns. Open and honest communication about improvements in mood, concerns, and potential side effects with a medical professional is important.

For some mental health concerns, a group therapy approach can be helpful. For example, anxiety disorders are often treated successfully in a group format. Having the opportunity to learn from others who are experiencing similar concerns in a safe environment with the guidance of a trained therapist can benefit many who think they may be alone in their struggles.

Similar to the group format are 12-step programs like Alcoholics Anonymous or Narcotics Anonymous, most commonly used for substance abuse treatment. Again, the social support provided by the group is often helpful for many individuals. One difference between 12-step groups and true "group therapy" is that most 12-step group meetings are led by one of the senior members of the group rather than by a trained professional.

Despite the treatment format you choose, just know that there are many treatment modalities that have proven effectiveness. In other words, you don't have to suffer from a mental health concern alone or forever – successful treatment is possible.

Brief Assessments for Mental Health Disorders

To assess your mental health, your health care provider may ask you to complete a short questionnaire about your feelings and personal habits.

Depending on the survey, example questions may include:

- During the last two weeks, did you have little interest or pleasure in doing things?
- During the last two weeks, did you feel down, depressed or hopeless?
- Have you had a poor appetite or are you overeating?
- Have you recently been able to concentrate on what you're doing?
- Have you recently lost much sleep over worry?
- Have you recently felt you were playing a useful part in things?
- Questions about how often and how much alcohol you drink

ADDITIONAL PATIENT RESOURCES

MentalHealth.gov

National Institute of Mental Health

Medline Plus

Alcoholics Anonymous

Narcotics Anonymous

PERFORMANCE

The Truth about Body Measurements

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An understanding of body mass index (BMI), body composition, waist-to-hip ratio and circumference numbers can help empower you to better understand how healthy you are and help plot your health successes over time. This chapter explains these numbers and describes how to perform the measurements.

Why is this Important?

Athletes tend to get wrapped up in numbers (e.g., points scored, tackles, statistics, wins/losses). The same tends to be true when we discuss personal health. There are a lot of numbers that are commonly used to assess health and help track progress over time, but they can sometimes be confusing, as certain measurements are more useful than others depending on the situation. Understanding body mass index, body composition, waist-to-hip ratio, and circumference measurements can help empower you to better understand where you are at and plot your successes over time.

BMI is a very common term and measurement. BMI simply looks at an individual's weight in relation to their height. It's important to understand that this tool was originally developed to look at the health risk in large populations rather than individuals, as there is likely an increased risk for negative health conditions at certain BMI levels. Researchers can collect this data on a large group and compare health risks between different groups. BMI has a lot of limitations when it comes to looking at each individual's true health risks, and is typically skewed in athletes to the point that it is not a useful assessment tool. Two important factors it does not take into consideration are body composition and the placement of fat storage.

Body composition is assessed by measuring body fat percentage. It breaks down an individual's weight into fat and lean body mass. Fat mass is just what it sounds like, additional fat mass stored on the body. Lean body mass includes everything that is essential including bones, tissues, organs, water, and muscle. Body fat can be measured through several different techniques including DEXA, under water weighing, Bod Pod, calipers, ultrasound, and bioelectrical impedance (BIA). All of these methods besides BIA require special equipment and a trained technician. BIA is more readily available to consumers via hand held devices and scales but is less reliable than the other methods.

SUMMARY POINTS

BMI is an estimate of **body fat based on height and weight**

In large population groups, **BMI predicts certain health risks**

Body composition is **a measure of body fat percentage**

Waist-to-hip ratio is **a simple way to estimate important health risks**

If you do choose to use BIA at home there are a couple tips to help ensure accuracy. First, weigh yourself and use the device at the same time of day. Typically, the best time is first thing in the morning after you've gone to the bathroom and while wearing light or no clothing. Hydration levels drastically affect the BIA reading, so you'll notice differences throughout the day or on different days where you may have had more or less fluids. There is no reason to weigh yourself or take body fat more than once per day and realistically once per week or every other week works well for many people. Body fat percentage won't likely change significantly for at least 3-4 weeks at a time, so don't get too caught up in any slight variations from day to day hydration. Healthy body fat levels are an individual consideration based on age, gender, body type, and overall health, so it's best to work with a professional to set an ideal goal.

Where the body deposits fat can increase the risk for many diseases. Visceral fat, which is typically stored in the belly around the organs, tends to be the most predictive of possible health risks. Measuring waist and hip circumference is simple and only requires a tape measure.

Once you have your waist and hip measurements, you can determine the waist to hip ratio. Simply divide the waist number in inches by the hip measurement in inches. There are differing opinions in assessing risk level, but in general it is recommended that men have a ratio less than 0.9 and women less than 0.8.

Several other body circumference measurements you could do monthly include your mid-thigh, mid-bicep and chest. These can help you see any changes over time, especially if you are trying to gain muscle or lose body fat and tell a more useful story than just focusing on the number on the scale.

Measuring your waist:

1. Place the tape measure tip on your belly button.
2. Wrap it around your waist until it meets back at your belly button.
3. Take a breath in and out and relax your stomach.
4. Record the measurement in inches.

Measuring your hip

1. Stand with your feet together.
2. Place the tape measure tip on the middle of your hip.
3. Starting in the front, wrap the tape around your hips so it goes over the largest part of your buttocks and thigh.
4. Record the measurement in inches.

Remember:

- ✓ Remove loose and extra clothing blocking your waist or hips
- ✓ Use a mirror or partner to make sure the tape is in a straight line and not twisted
- ✓ Breathe normally and have good posture while taking measurements
- ✓ The tape should be 'relaxed' without slack or being too tight
- ✓ Simply divide the waist number in inches by the hip measurement in inches. There are differing opinions in assessing risk level, but in general it is recommended that men have a ratio less than 0.9 and women less than 0.8.

ADDITIONAL PATIENT RESOURCES

Centers for Disease Control and Prevention

National Heart, Lung, and Blood Institute BMI calculator

MEDICAL DISEASES AND CONDITIONS

DISEASES AND CONDITIONS

Diabetes Mellitus

Leon Scott, MD, *Vanderbilt University Medical Center*

Data from the Centers for Disease Control and Prevention (CDC) indicate that over a third of Americans have diabetes mellitus, also known as diabetes (high blood sugar), or prediabetes (higher than normal blood sugar, but not high enough to be diabetes). If diabetes isn't controlled, patients can develop serious health problems including heart disease, nerve damage, eye damage, sexual and kidney problems. This chapter explains diabetes and provides an overview of medications, and nutritional and exercise recommendations to help control diabetes.

Why is this Important?

Over a third of Americans have diabetes mellitus (DM) or prediabetes. Serious consequences occur if diabetes and prediabetes are not treated. However, with the correct treatment and recommended lifestyle changes, many people with diabetes can delay or even prevent the onset of complications. This chapter will explain practical tips that will help you or a loved one who may be struggling with these issues.

What Is Diabetes Mellitus?

Diabetes mellitus (DM) is a disorder that impairs your body's ability to manage the amount of a sugar, known as glucose, in your body. When your body cannot manage the glucose in your blood stream, numerous problems occur. Glucose can stick to the walls of blood vessels (glycosylation), making them stiff and poor at transporting blood. When this happens in blood vessels in the eyes, it leads to blindness. When this happens in the heart, it leads to heart attacks. When this happens in the brain, it leads to strokes. When it happens in blood vessels that feed nerves, it leads to neuropathy (numbness of the limbs). When it happens in your penis, it leads to erectile dysfunction. When it happens in the skin, it leads to wounds that heal slowly, if at all. Too much glucose in the blood stream also pulls water from your body, changing the concentration of all the minerals your body needs for proper function. Also, if glucose is stuck in your blood stream and cannot get inside the organs that need the energy, the alternate energy pathway the body uses creates an acidic environment that is less efficient for the body (these blood acids are called ketones). This can lead to a life-threatening condition, known as diabetic ketoacidosis or DKA. DKA occurs when your body can't produce enough insulin and ketones build up in your blood.

SUMMARY POINTS

In Diabetes Mellitus (DM) your body **cannot manage the amount of a sugar, known as glucose,** in your body

Type 2 DM is the **most common form of DM**

Eating foods with low glycemic indices and higher fiber **decreases the risk of developing DM and improves glucose control** in people with DM

If you have DM, you must **test your blood sugar values regularly**

Proper diet and exercise are **key to preventing and/or controlling DM**

No matter what food you eat containing carbohydrates (candy, breads, or fruits/vegetables), your body converts most of the sugar to glucose. Glucose is the primary fuel we use to power our brains, muscles, and other organs.

Glucose is controlled by a hormone called insulin. Type 1 diabetes is predetermined genetically and patients require treatment from a young age, usually with insulin. Type 2 diabetes is acquired as you go through life. In Type 1 DM, the body cannot generate insulin. In Type 2 DM, the most common form of DM, the body has decreased sensitivity to insulin. Age, family genetics, obesity, activity level, and diet affect your body's sensitivity to insulin. Decreased exercise, eating excessive food, and possibly eating less than the daily recommended amount of Omega-3 fat puts people at higher risk for developing Type 2 DM.

The remainder of this chapter focuses on Type 2 DM, since that is more common in current and former athletes.

Screening

Health care providers should routinely screen individuals at risk for DM. The most commonly used recommendations come from the American Diabetes Association (Table 1). Appropriate screening can help identify people with prediabetes, establish the presence of DM, and help manage the disease.

The most common screening tests for DM and prediabetes are Fasting Blood Sugar (FBS), also known as Fasting Plasma Glucose, and hemoglobin A1C (HgbA1C), which measures the amount of hemoglobin that is glycated, or saturated with glucose. HgbA1C is a very powerful tool, since it is an indirect measure of blood sugar over a period of months, even though it is drawn at a single point in time.

These are the screening criteria for prediabetes and diabetes:

Table 1A

Criteria for prediabetes and diabetes

	Prediabetes	Diabetes
Fasting Blood Sugar	100-125 mg/dL	> 125 mg/dL
Hemoglobin A1C	5.7-6.4%	>6.5%

Table 1B

Screening recommendations for Type 2 Diabetes
American Diabetes Association

Adults overweight (BMI * 25kg/m2) and any of the following risk factors

- HgbA1C > 5.7% or fasting glucose > 100mg/dL
- Acanthosis nigricans (a skin condition that causes area of skin to darken and thicken)
- Cardiovascular disease (heart disease)
- First degree relative with Type 2 DM
- HDL < 35 mg/dL (the good cholesterol)
- Triglyceride > 250 mg/dL (fat in the blood)
- Minority ethnicity
- Blood pressure >140/90 or diagnosis of hypertension
- Inactivity
- Polycystic ovary syndrome (an imbalance in female hormones)

All adults over 45 years of age

Testing

If you are diagnosed with DM, your healthcare provider(s) will require that you test your blood sugar values regularly and your Hgb A1C levels several times a year. Depending on your treatment regimen, you may only be required to check weekly, but most frequently patients will be asked to do daily checks. Individuals using insulin to treat diabetes often test their blood four times daily (before each meal and before bedtime). The testing currently requires a lancet pierce of the skin to draw drops of blood.

Treatment - Diet changes

A registered dietician or certified nutritionist can create diet interventions that prevent or treat DM. Their suggestions will include managing the type of carbohydrates in food, the composition of macronutrients (carbohydrates, fat, and protein) in food, and portion control for consumed food.

Managing the type of carbohydrates in our food

The glycemic index (GI) is a measure of how rapidly the carbohydrates we eat are absorbed and converted to glucose. Foods with high glycemic indices are absorbed quickly, leading to large spikes in blood glucose levels and the amount of insulin released in the body. Many people often refer to these foods as "carbs." Foods with low glycemic indices lead to more gradual absorption and slower and lower increases in glucose and insulin levels. Also, foods with low glycemic indices proportionally have more fiber. Numerous studies support that eating foods with low glycemic indices and higher fiber decreases the risk of developing DM and improves glucose control in the people with DM.

Table 2 shows food options in different glycemic categories, but that table alone is not enough for most individuals to make healthy diet changes. The next section will focus on practical tips to help make the healthy choice an easier one.

Table 2

Examples of food categorized with glycemic index (GI)

High GI	Moderate GI	Low GI
Watermelon	Bananas	Apple with skin
Sweetened cereal	Shredded wheat cereal	Oatmeal
Cookies & Candies	Grapes	Oranges
Baked potato	Red potato	Sweet potato
Instant rice	Brown rice	Pre-crumbled cauliflower
White bread	Whole wheat bread	Multi-grain bread

Tip 1: Use the 10-to-1 ratio with starches

Carbohydrates come in many foods: fruits, vegetables, nuts, and grains. Grain sources and vegetables, including potatoes, are referred to as "starches", because they are made of long chains of glucose molecules known as starch. The food category of starches includes breads, flour, rice, and potatoes. When you shop for starches, limit yourself to those with a 10-to-1 ratio for carbohydrates to fiber. The lower the ratio the better, but the 10-to-1 ratio has the benefit of being easy to calculate.

Get into the habit of looking at the nutritional information on the food label, and scanning quickly for the carbohydrate-to-fiber ratio (Fig 2). The first place to look at the Nutrition Facts label is the Carbohydrate amount per serving. This is listed in grams. Then look under that number at the amount of Fiber, also listed in grams. These two numbers make up the carbohydrate-to-fiber ratio.

Be especially careful with breads and cereals. Many "whole-grain" breads and cereals are promoted as healthy options. Some even have certifications from the American Heart Association as "heart-healthy." Unfortunately, that certification alone is insufficient. If you turn over the label, you may find a serving has 22 grams of carbohydrates and only 2 grams of fiber. That is an 11-to-1 ratio, and that doesn't cut it. On the other hand, many cereals, even frosted sweetened cereals, breads, rice, and tortillas pass the 10-to-1 criteria. Remember, 10-to-1 carbohydrate to fiber ratio is the upper limit on carbohydrates to fiber.

Figure 2

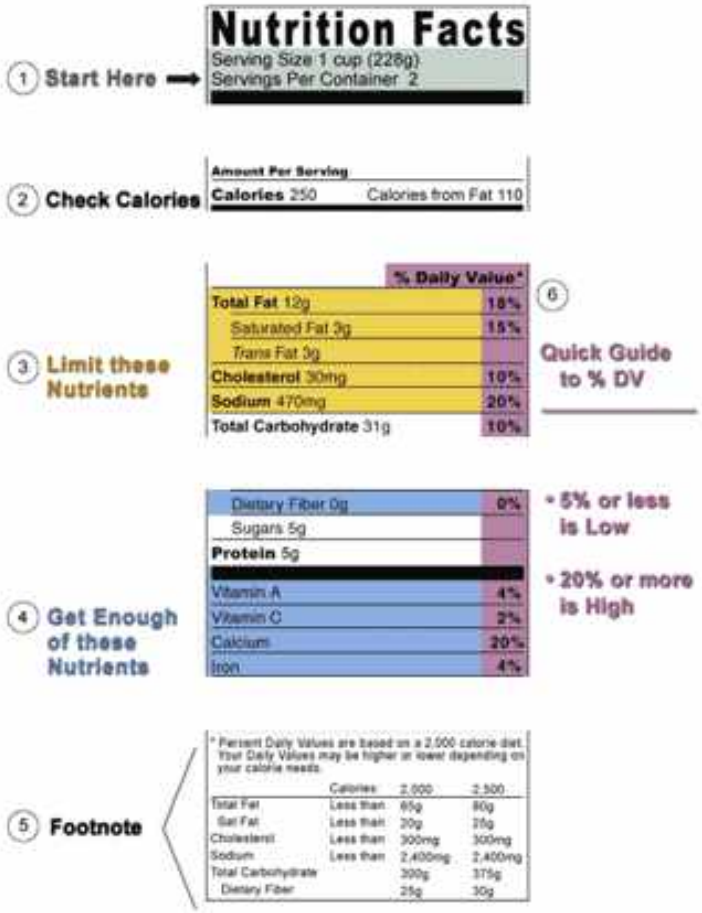

Table 3

Vegetable conversion options	
Steak and potatoes	**Steak and baked sweet potato**
Steak and mashed potatoes	**Steak and asparagus**
Steak fries	**Sweet potato fries**
Rice	**Steamed pre-crumbled cauliflower***
Pasta/noodles	**Sautéed spinach**
Home-made macaroni and cheese	**Home-made macaroni and cheese with butternut squash***

**save time and purchase pre-crumbled and pureed items*

Tip 2: Eat red sauce with your pasta

It may still be difficult to find pasta that meets the 10-to-1 ratio mentioned above. Whole wheat pastas and some vegetable pastas meet this criterion, but they may not be readily available at every grocery store. Most red pasta sauces, derived from tomatoes, have a significant amount of fiber. This will often bring the total ratio of carbohydrates to fiber back to the recommended 10-to-1 ratio.

Tip 3: Find your favorite vegetable

Many of us create a fear or distaste for vegetables. This often leads to a limited experience with vegetables or their many preparations. As adults who desire to conquer and control Type 2 DM, it is critical that we take steps towards making vegetables a regular part of our meals. The eventual goal is to make vegetables the main carbohydrate consumed with most meals. Although corn and potatoes are vegetables, and corn meets the 10-to-1 ratio rule, challenge yourself to expand your options. Use the following table for suggestions (Table 3). These conversions will also help you lose weight, as many of the options are less dense with calories.

Managing the composition of your food

In addition to improving the glycemic index of our carbohydrates, it is important to balance the amount of protein and fat in the food we eat. Balancing your fat intake may also improve the body's sensitivity to insulin. Diets high in saturated fats, omega-6 fats and even mono-unsaturated fats without an appropriate amount of Omega-3 fats are associated with decreased sensitivity to insulin.

Many are aware of the recommendation to eat a diet where 60% of calories is low glycemic index carbohydrates, 30% is lean protein and 10% is healthy fats. These numbers may appear difficult to obtain, but the following practical tips will help simply the concepts.

Tip 4: Each meal needs a balanced carb, lean protein and healthy fat

Balanced carbs are starches that follow the 10-to-1 rule, vegetables/fruit with the skin left on, or nuts. Lean proteins include nuts, vegetables/beans, and lean animal sources. Lean animal sources include low-fat milk, beef without the fatty edges, poultry, fish, bison, whey protein, and other items. Please notice that vegetarians/vegan diets have plenty of protein options with nuts, vegetables, vegetable-based protein supplements (e.g. soy or pea-protein) and beans. Healthy fats are naturally in minimally processed lean animal protein sources, nuts, and seeds/oils. Specifically, Omega-3 fats can be found in salmon, chia seeds, walnuts, and egg yolk. You can also find them in supplements of krill oil, cod liver oil, and flaxseed oil, but food sources are recommended.

Be cautious if you plan on improving your body's Omega-3 composition by taking supplements and eating fat-free foods. Many manufactured fat-free foods are filled with high glycemic index sugars to make them palatable. Once absorbed, the high-glycemic sugars can lead to insulin resistance, as mentioned before, but it also leads to increases in blood fat levels because some are converted in the liver to triglycerides, a free-fat that floats in the blood and is stored as fat on your body. It is better to eat foods that are naturally lower in fat and full of low-glycemic index carbohydrates.

During each meal, including snacks, you should be able to identify the balanced carbohydrate, lean protein, and healthy fat sources. If you cannot easily see them, then add the missing component. Notice how many of the foods cross the food categories. Nuts, vegetables, and lean animal sources can provide for two or more of the categories. If you do not have allergies, nuts are an amazing group of foods that give you an unmatched combination of

It is better to eat foods that are naturally lower in fat and full of low-glycemic index carbohydrates.

You don't need to wait until a meal to drink water, in fact, it helps you remain full and snack less.

Portion control

Portion control is also a crucial component to reducing your risk of developing DM and controlling your DM. Decreasing the load of carbohydrates you consume has not been as well associated with controlling DM as lowering the glycemic index. However, lowering your portion size will help with weight loss in obesity. In patients with Type 1 DM and insulin-dependent Type 2 DM, the portions of food eaten also help calculate the number of carbohydrates consumed, which is needed to calculate the correct amount of insulin to inject.

Standard 7"x7", 25 oz. plastic-ware tubs are a great tool for portion control. These are often called entrée containers, but these are large enough to carry a whole meal. As you prepare your meal, the final serving should fit in this container. If you need to keep yourself accountable, consider using this container as your serving plate for a month so you can develop good habits. Store your leftovers in these containers, as well. This will help you consistently stay in control of your food portions.

If you are consistently hungry between meals, give yourself an opportunity for up to 5 meals per day. These "snacks" between breakfast, lunch, and dinner are good times to practice more good habits. Enjoy one of your packaged leftovers or have a cup of your favorite nut.

If you need a snack, and you are at a store, look for food with protein and a 10-to-1 ratio as mentioned before. Keep these tools in your desk drawers, counter tops, and travel bags. They need to be more accessible than chips, cookies, and the sneakily unhealthy veggie-straws/chips.

The DASH (Dietary Approaches to Stop Hypertension) diet described in the **following chapter** is aligned with dietary recommendations for diabetes.

Treatment – Consistent Exercise

Routine exercise has the benefit of reducing the risk of Type 2 DM, controlling active Type 2 DM, and supporting weight management. Other practical benefits include maintaining strength and function.

This section will focus on exercise for Type 2 DM that does not require insulin for treatment. For patients with insulin-dependent Type 2 DM or Type 1 DM, exercise requires close initial monitoring to avoid

Tip 5: Find a way to love water again

Water is often forgotten when trying to create a balanced nutrition plan. Your primary beverage should be water, but it is bland. Add ice to it, infuse it with fruit and carry it with you in non-disposable water bottles so you have fewer episodes where you satisfy your thirst with sweetened drinks.

The amount of water you drink is individual, but a good rule of thumb for adults is to drink 32-40 ounces per day and an additional 10 ounces for every 20 minutes of sustained moderate exercise. Talk with your registered dietician or other healthcare providers to determine if your personal volume should be adjusted based on your kidney function. A simple tool to use is a water bottle with marked into thirds. You drink the first third in the morning, the second third at lunch, and the last third at the end of day. You do not need to wait until a meal to drink these amounts, in fact you may find drinking between meals helps you remain full and snack less.

This recommendation also extends to cutting out sports drinks. Unless you are 1 hour away from starting a high-intensity exercise, or have just completed two hours of high-intensity exercise, you have no reason to drink any sports drinks. When you can benefit from a sports drink, in the situations noted previously, you only need up to 12 ounces-- the size of the smallest bottle of sports drink available in most stores. The same beloved sports drink you enjoyed all through your playing career is only healthy for you post-career during those two restricted times. Further, be cautious using water additives with non-sugar sweeteners. They have recently become popular, and can make it easier for people to consume more water. However, they also increase cravings for sugars and foods with a high GI.

dangerously low blood glucose levels and the details go beyond the scope of this chapter. However, anyone reading this should be encouraged that there are many cases of patients with Type 1 DM who are able to personalize their diet and exercise programs to the point where they can wean off from insulin completely. Even for those who cannot wean completely, the amount of insulin can be lowered significantly, saving patients time, money, and restoring a sense of freedom from medications.

On average, we expect patients will achieve a 10-20% reduction their hemoglobin A1C measurement, a measure of long-term glucose exposure, after three months of high-intensity exercise. Other benefits of exercise include a 20% reduction in triglycerides, a 5% drop in LDL (bad cholesterol), a 25% increase in HDL (good cholesterol), an average of 8 points dropped in systolic blood pressure, a 30-40% reduction in risk for heart attack, and a 50-60% reduction in your risk for stroke in those same three months. No prescription medication available is as effective as exercise. Exercise is not only the best medicine; it should be treated as an essential part of your treatment regimen.

For those with Type 2 DM, which does not require insulin, you should obtain medical clearance for the level of exercise, appropriate activities, and exercise schedule.

Medical clearance classifies adults as low-risk, moderate-risk, high-risk (Table 4). Individuals with moderate-risk, will want to know their maximum heart rate (HRmax) with an exercise stress test before starting vigorous exercise. Cardiologists often administer these tests. Call your local cardiology office to determine if they do this testing. Individuals with high-risk will want to know their HRmax before starting any moderate or vigorous exercise (Table 5). These stress tests measure HRmax at exhaustion, cardiopulmonary symptoms,

Table 4

Risk stratification for exercise

Risk factors

- ◯ Family history of males <55 years old or female <65 years old with heart attack or sudden unexplained death
- ◯ Smoking history in the last 6 months
- ◯ Blood pressure ≥140/90 or using blood pressure medication
- ◯ LDL >130 HDL <40 or total cholesterol > 200
- ◯ Fasting glucose > 100
- ◯ BMI ≥ 30 or waist larger than 40 inches in men, 35 inches in women
- ◯ Not active for 30 minutes a day at least 4 days with structured exercise

Low Risk	Moderate Risk	High Risk
Men <45 yo, with no more than one risk factor **Women** <55 yo with no more than one risk factor	**Any man** ≥ 45 yo **Any Woman** ≥ 55 yo **Any individual** with two or more risk factors	Known heart or blood vessel disease Known chronic lung disease Signs of heart or lung disease including dyspnea or limb edema
Moderate Activity 60-70% of estimated HRmax **Vigorous Activity** >70% of estimated HRmax	**Moderate Activity** If < 65 yo, 60-70% of estimated HRmax If ≥ 65 yo, HR at 60% of measured VO2max or 60-70% of measured HRmax **Vigorous Activity** HR at > 60% of measured VO2max or > 70% of measured HRmax	**Moderate Activity** HR at 60% of measured VO2max or 60-70% of measured HRmax **Vigorous Activity** HR at > 60% of measured VO2max or > 70% of measured HRmax

or the presence of abnormalities on an EKG reading to measure for changes in heart function.

Level of exercise

Individuals with low-risk can work with a personal trainer or exercise coach to build up to moderate exercise (60-70% of HRmax) 30 minutes per day, 5 days per week. They may also opt for vigorous exercise (>70% of HRmax) 20 minutes per day, 3 days a week, and 2 additional days per week of resistance strength training. Their maximum heart rate can be estimated using the equation: HRmax = 220 - (age in years) However, individuals with moderate-risk or high-risk, or older than age 65 should have an exercise stress test to determine their true HRmax.

Your maximum heart rate can be estimated using the equation:

HRmax = 220 - (age in years)

Wear a heart rate monitor to keep track of your heart rate. Try not to let your heart drop below your target while you are exercising. During breaks between exercises your heart rate will remain elevated, but it will slowly drift down. Start the next exercise before it drops below your target.

Table 5 should inspire you to find an activity you like, not limit you to only what is included. One of the benefits of popular heart rate monitors, like your Apple Watch or FitBit™, is the ability to do any activity you love to achieve the desired heart rate for the recommended period. Dancing with your spouse is exercise. Pilates one day, running the next, tennis with friends, a cross-fit class, and a spin class all count if your heart rate reaches and stays at the target levels for the recommended length of time.

It is difficult, and unsafe, to go from being inactive to participating in vigorous exercise. Work with a physical therapist or certified personal trainer to ease into your new program. Expect it to start with activity one day per week more than you currently do, and add a day each week as you go towards your goal. Make sure to schedule it on your phone or daily planner each week to keep yourself accountable. It may also help to exercise with a friend. However, while exercising with one friend is perfect for motivation, adding more may lead to distractions or breaks too long to maintain your target heart rate.

Table 5

Examples of moderate and vigorous exercise

Moderate	Vigorous
Walking 3.5 mph on an incline	Walking 4.5 mph on an incline
Walking 4.0 mph on a flat surface	Jogging
Double tennis	Calisthenics
Modified group aerobics/dance/spin	Group aerobics/dance/spin
Yoga	Swimming
Pilates	Crossfit
Weight-lifting	

Medicine

Have you noticed that we haven't focused on medications for diabetes until this point? While medicine is a vital component for managing Type 2 DM for many people, outside of diabetic emergencies, they should only start after using the diet and exercise programs described above.

This section will summarize the medication therapies for Type 2 DM. When needed, most practitioners start with Metformin as monotherapy, and advance to dual to triple therapies until blood sugar control is achieved with minimal side effects.

Use the information here to start a conversation with your healthcare provider (Table 6). They will be able to answer specific questions regarding these treatment options.

Metformin is a medicine that decreases the liver's ability to make glucose and increases the body's sensitivity to insulin. This medicine is used as a first line treatment for Type 2 DM, but also used for pre-diabetics with concerning laboratories (e.g., FBS 100-125 or Hgb A1C 5.7-6.4%).

Sulfonylurea stimulates insulin to be released from their cells in the pancreas. This leads to more glucose absorption by the organs of the body, and reduces the amount of glucose in the blood stream.

Thiazolidinedione (TZD) is a group of medicines that often end with the suffix -glitazone. They reduce the amount of free-floating fats in the blood, making the body more dependent on glucose for energy. This helps decrease the amount of glucose left in the blood stream.

Dipeptidyl peptidase-4 inhibitors (DPP4 inhibitors) are medicines that often end with the suffix -gliptin. Prior to insulin release, there is a hormone named incretin. When it is around, it stimulates insulin release and blocks the release of a hormone that counters insulin. DPP4 inhibitors block a signal that blocks the release of incretin. With more incretin, the body releases more insulin, has fewer signals that counter insulin, and therefore more signals for glucose to be absorbed by the organs that can use it.

Glucagon-like peptide 1 receptor agonist (GLP1 receptor agonist) is currently a once daily, injectable medicine. The generic name is liraglutide. GLP1 is a type of incretin, which you may remember stimulates insulin release. Liraglutide acts like an extra GLP1 incretin, stimulating more insulin, and signals for glucose to be absorbed by the organs that can use it.

Sodium glucose transporter-2 inhibitors (SGLT2 inhibitors) are medicines that often end with the suffix -gliflozin. As glucose sits in the blood stream, it passes through the kidneys. These medicines block it from being completely reabsorbed in the kidneys, and the glucose passes into the urine. The blood that leaves from the kidneys has a lower glucose concentration.

Insulin analogs are the last groups of medicines. These are engineered

Table 6

Diabetes Mellitus Type 2 Pharmaceutical Therapies, excluding insulin

Medicine	Metformin	Sulfonylurea	TZD	DPP4 inhibitor	GLP1 receptor inhibitor	SGL T2 inhibitor
Mechanism	Increase sensitivty to insulin	Stimulates insulin release	Remove fat from the blood, encouraging glucose use	Increases hormone levels that increase insulin levels	Acts like the hormone that increases insulin levels	Causes excess glucose to be filtered into the urine
Side effects	Diarrhea, fatigue and possible weight loss	Weight gain and low blood glucose light-headedness	Weight gain and water retention	Headache	Weight loss, diarrhea	Weight loss, increased urination, urinary tract infections & dehydration

molecules that patients inject for the insulin effects on glucose in the body. When the body can create insulin on its own, it is constantly released into the body, up-regulated and down-regulated by various signals. To create the constant level of insulin, biomedical engineers have created various forms of insulin that stay in the blood for longer periods of time (insulin glargine [Lantus®] and NPH insulin) for a baseline, with mealtime doses of faster acting forms of insulin (insulin lispro [Humalog®] and insulin aspart [Novolog®]). Some patients graduate to using an insulin pump for constant insulin infusion, reducing the number of times they must inject themselves.

Incorrect use of insulin, both under-dosing and over-dosing, can be life threatening. Therefore, it is important to review the instructions with your diabetes educators, endocrinologists, and primary care providers. It is also another reason why it is important to promote prevention, screening and the use of lifestyle changes to stop the progression of diabetes in this country.

Summary

While diabetes and prediabetes are common illnesses with potentially serious consequences if undiagnosed and untreated, the good news is that if it is diagnosed early and appropriately managed, those consequences can be avoided. Make sure your doctor screens your fasting blood sugar and hemoglobin A1C during your yearly physicals. If your levels show that you are prediabetic or diabetic, be aggressive with diet and exercise in order to possibly avoid medications. If medications are necessary, use them in conjunction with, not instead of, diet and exercise. Diagnosed early and treated appropriately, this is a disorder you can live with.

ADDITIONAL PATIENT RESOURCES

American Diabetes Association

WebMD

National Institute of Diabetes and Digestive and Kidney Disorders

Centers for Disease Prevention and Control

Diabetes Research Institute

DISEASES AND CONDITIONS

Hypertension

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Elevated Blood Pressure (Hypertension) is a very common condition. Left untreated, it can lead to serious health problems. This chapter provides an overview of hypertension as well as lifestyle and medication strategies to control it.

Why is this Important?

Elevated Blood Pressure (Hypertension or HTN) has been estimated to affect roughly 46% of the adult population in the US, and is the most common condition seen by primary care physicians. When left untreated, it can lead to heart attacks, heart failure, strokes, kidney failure, vision problems, and erectile dysfunction. It is the most common risk factor for heart attacks and strokes.

What does it mean?

Blood pressure is a measure of the pressure on the walls of your arteries, and reflects how hard the heart must work to pump blood. It is reported as two numbers with the highest number being the systolic pressure (as the heart beats) and the lowest number being the diastolic pressure (when the heart is relaxed between beats), and is measured in millimeters of mercury, but most people just use the numbers. Normal blood pressure for a patient is generally defined as 120/80 mm Hg or less.

Am I at risk?

Most people with hypertension have are affected by what is called essential hypertension, where the cause of hypertension is unknown but is thought to be due to a combination of genetic and environmental factors. However, there are certain risk factors that are clearly associated with hypertension, including:

- Increasing age
- Obesity
- Family history of hypertension
- Race (African Americans have at higher risk)
- Physical inactivity
- Poor diet (especially with high salt intake)
- Heavy alcohol use
- Obstructive sleep apnea

In secondary hypertension, the elevated blood pressure is caused, at least in part, by separate, ongoing conditions, like kidney disease, hormonal problems, and the use of medications (such as decongestants, steroids, weight loss medications, and ADHD medications) or illicit drugs (cocaine, methamphetamines). Excessive intake

SUMMARY POINTS

Approximately **46% of the U.S. adult population** has high blood pressure

Normal blood pressure is defined as **less than 120/80**

High blood pressure often has no symptoms until late in the disease process, when serious damage to organs may have occurred

Lifestyle modifications are the first line treatment for hypertension (or elevated blood pressure)

There are several types of **well-tolerated medications** for hypertension management

A study of NFL athletes showed that **they more commonly had both hypertension and pre-hypertension** compared to the general population, but there was **no difference in African American athletes**

of NSAIDs (like Ibuprofen, Naproxen Sodium) can aggravate blood pressure and interfere with the effectiveness of blood pressure medications.

How do I know if I have it?

While a blood pressure below 120/80 is considered normal, blood pressure readings are further categorized as elevated (120-129 /<80), stage 1 hypertension (130-139/80-89) and Stage 2 hypertension (>140/90). While both numbers are often elevated in hypertension, it is important to note it can also be diagnosed based on an elevation of either systolic or diastolic pressure measurements alone.

Hypertension usually does not cause any symptoms, but that doesn't mean it isn't doing serious damage. There are millions of Americans walking around with significant hypertension unbeknownst to them. This is the reason why it is often nicknamed the "silent killer," and is why it is very important that you see a primary care physician for a yearly exam. Checking your blood pressure is a standard part of an annual physical. Typically, your physician will diagnose you with hypertension if you have elevated blood pressure readings on at least two different office visits. For a more accurate assessment, you may be asked to monitor your blood pressure at home.

What are the treatments?

While there are many medications available to treat hypertension, the first line treatment for hypertension is often lifestyle modifications. If you have certain risk factors with cardiovascular disease, and have stage 1 hypertension or higher, you should be started on medications. If you do not have significant risk factors, you should start medications once you reach stage 2 hypertension. Your doctor will likely treat you with a goal of reducing your blood pressure to below 130/80.

Lifestyle Modifications

Reducing your Sodium (salt) intake is very important but can be difficult to do. Most people are not aware that they consume much more sodium than is recommended. Sodium does not only come from adding salt to your food, as packaged and processed foods are very high in sodium. The recommended daily consumption of sodium is less than 2,000 mg (or 2 g). One easy way to monitor salt intake is to read product nutritional labels and keep track of intake throughout the day. In general, it is a good idea to avoid packaged and canned foods. If you eat packaged and canned items, choose foods with less than 400 mg of sodium per serving. Reducing salt intake is especially important if you take NSAIDs (Naproxen, Ibuprofen) for pain management, because NSAIDs can make your body hold onto the salt in your diet. This can raise your blood pressure and make your medications less effective.

Losing weight by decreasing foods high in sugar and fat, as well as increasing fruit and vegetable intake, can also help lower blood pressure. Aerobic exercise at least 4 days per week for at least 30 minutes has been shown to be beneficial. Limiting alcohol intake to less than 2 drinks per day and smoking cessation are important parts of a healthy lifestyle that can help keep your blood pressure under control. Sugary beverages are also associated with elevated blood pressure, perhaps because they contribute significantly to weight gain. A diet high in potassium-rich foods (leafy vegetables and fruits), low fat calcium products (skim milk, low fat yogurt, etc.) and whole grains (oatmeal, dark breads, etc.) called the DASH diet (Dietary Approaches to Stop Hypertension) has been proven to lower blood pressure and is especially effective among African Americans.

Designed to help treat or prevent high blood pressure (hypertension), the DASH diet is a lifelong approach to healthy eating. The DASH diet emphasizes portion size, eating a variety of foods and getting the right amount of nutrients. The DASH diet encourages you to reduce sodium in your diet and eat a variety of foods rich in nutrients that help lower blood pressure, such as potassium, calcium and magnesium. Over time, your systolic blood pressure could drop by eight to 14 points, which can make a significant difference in your health risks. The DASH diet also aligns with dietary recommendations to prevent osteoporosis, cancer, heart disease, stroke, and diabetes.



The DASH Diet Principles

Principles	Servings	Food
Vegetables	4-5 servings/day	Carrots, sweet potatoes, pumpkin, winter squash Green leafy vegetables (broccoli, kale, cabbage, etc.), green beans Tomato salsas, 6-oz servings of tomato juice or other vegetable juices
Fruits	4-5 servings/day	Fresh fruits, including apples, bananas, cantaloupe, melons, berries Red or black grapes; grape juice (1 cup/day) Grapefruit, especially pink (40% more beta carotene) Dried fruits, especially apricots, dates, prunes Pomegranates and other antioxidant juices (blueberry juice, red wine, orange juice, cranberry juice green tea)
Protein-rich foods	≤2 servings	Lean chicken and turkey breast Salmon and other fish Meats that are lean or have fat trimmed away
Low-fat dairy	2-3 servings/day	Skim milk and yogurt (8oz.) Low-fat cheeses (1-1.5 oz./serving)
Low-fat foods		Tomato sauces with pasta Homemade pizza with low-fat toppings (chicken, vegetables, low-fat cheese)
Grains	7-8 servings/day	Oatmeal, shredded wheat; high-fiber, low-sugar cereals Baked whole-wheat chips and tortillas Whole-grain breads and pastas, wheat germ
Nuts, seeds & dry beans	4-5 servings/week	Peanuts, walnuts, almonds, pistachios, other nuts in moderation Pumpkin seeds, sunflower seeds, sesame seeds Bean and chickpea dishes and dips
Oils	2-3 servings	Olive oil and canola oil substituted for other oils Salad dressings and dips with nonfat sour cream or homemade yogurt

Medications

Lifestyle modifications will always be recommended first, but often medications will be necessary. There are several types of medications for hypertension management, and their use is guided by evidence-based physician protocols:

- **ACE inhibitors:** Angiotensin converting enzyme (ACE) inhibitors work by preventing the formation of Angiotensin II, a hormone that causes narrowing of the arteries and an increase in blood pressure. As a result, blood vessels widen and pressure decreases. In general ACE inhibitors are very well tolerated; the most common side effect is a dry hacking cough (more common in women and people of Asian descent) that can be resolved by stopping the medication. Common names are Lisinopril, Fosinopril, and Enalapril.

- **Angiotensin receptor blockers (ARB):** ARBs are used mainly in people who cannot tolerate ACE inhibitors due to side effects (i.e., cough), but may also be used as a first line drug. They work by preventing Angiotensin II from narrowing your arteries. Common names are Losartan, Olmesartan, and Valsartan.

- **Diuretics:** They work by making the kidneys eliminate sodium and water, causing increased urine output and a decrease in total blood volume. There are different classes of diuretics. The most commonly used class for hypertension is Thiazides (Chlorthalidone, Hydrochlorothiazide, Indapamide). They are generally very well tolerated but can sometimes cause low potassium (hypokalemia). Your doctor needs to monitor your potassium levels if you are on a thiazide diuretic. There are also Potassium-sparing diuretics (Spironolactone, Triamterene, Amiloride) that do not cause a decrease in potassium. For most people, they tend to be less potent but can be quite useful in certain cases. Loop diuretics (Furosemide, Bumetanide, Torsemide) are powerful agents that are not typically used to treat hypertension except for people with heart failure or significant kidney disease.

- **Calcium channel blockers** work by decreasing the amount of calcium that enters the smooth muscle cells that surround blood vessels, thereby causing the vessels to dilate and decrease blood pressure. Common names are Amlodipine, Nifedipine, and Felodipine. Other calcium channel blockers also work on the heart muscle, decreasing its contraction (e.g., Diltiazem, Verapamil). The most common side effect is swelling of feet and ankles.

- **Beta Blockers** function by reducing the sympathetic nervous system (the "fight or flight" response) that usually increases heart rate and blood pressure. Common names are Metoprolol, Carvedilol, Bisoprolol, Atenolol. They can cause fatigue, low heart rate, and decreased ability to exercise.

- **Alpha receptor blockers** work by causing blood vessels to dilate. They are not used very often for blood pressure control as they have significant side effects, especially dizziness upon standing. They are usually not recommended in people greater than 65 years old due to those side effects. An interesting side effect is that they can improve urination in men with enlarged prostates in addition to decreasing blood pressure. Common names include Terazosin, Prazosin, and Doxazosin.

- **Direct Vasodilators** work by reducing the tone in blood vessels. They are typically used only in cases of extremely high blood pressure or if other agents are not sufficient. The most likely side effects are increased heart rate and leg swelling. Common names are Hydralazine and Minoxidil. Interestingly, Minoxidil frequently stimulates hair growth and the topical form is sometimes used to treat baldness.

Treating hypertension is proven to have profound benefits for health and longevity. The great news about treating high blood pressure is this: there are so many effective medications that if a certain drug (or combination) doesn't work or causes problems, there is almost always another one that will be better. It is not uncommon to require more than one medication for good blood pressure control. Your doctor should choose specific medications for you based on your individual health and risk factors, including other conditions you may have and any other medications you may be taking. In general, ACE inhibitors, Thiazide diuretics, or calcium channel blockers should be used as first line agents, but they often will be combined with another drug for complete control.

It is important to note that most of the commonly used blood pressure medications are well tolerated but they sometimes have side effects, including erectile dysfunction. Fortunately, side effects are usually easily controlled by using alternate medications or adjusting combinations of drugs.

Hypertension in NFL Athletes

A 2009 study of over 500 NFL athletes showed a higher incidence of both hypertension (BP >140/90) and elevated blood pressure (BP >120/90 but <140/90), despite lower levels of impaired fasting glucose and similar lipid profiles. Athletes with high BMIs (BMI > 30) had a higher incidence of hypertension.

Many factors may have led to these findings, including the use of NSAIDs, high levels of weight resistance training, and obstructive sleep apnea, but none of these connections have yet been proven. ***All of this means that yearly blood pressure screening should be a part of the health care regimen for every current and former NFL athlete.***

ADDITIONAL PATIENT RESOURCES

American Heart Association

MedicineNet.com

Mayo Clinic

National Heart, Lung, & Blood Institute

DISEASES AND CONDITIONS

Hypercholesterolemia (High Blood Cholesterol)

Thom Mayer, MD, FACEP, FAAP, FACHE, *Medical Director, NFL Players Association*

High blood cholesterol (hypercholesterolemia) is a serious, but silent condition. This chapter explains the condition, the risks for developing it, and prevention and treatment strategies.

Why is this Important?

High blood cholesterol (hypercholesterolemia) is a major health threat, affecting nearly 100 million Americans or roughly 30% of the entire population. High cholesterol is most common in Hispanics (39%), followed by African-Americans (31%) and Non-Hispanic Whites (29%). It is important, not just because of its frequency, but also because it can increase the risk of stroke and heart attacks, two diseases with potentially devastating consequences.

High cholesterol doubles the risk of stroke and heart attack, if it is not treated. Even more important, high cholesterol is a totally silent condition-until it's not! In other words, it isn't something that causes symptoms initially and can't be diagnosed without blood tests, but it can cause build-up of harmful plaque deposits in the blood vessels feeding the heart, brain, and muscles. High cholesterol levels cause gradual plaque build-up, but no one notices until a critical level is reached and the blood vessel is occluded, either by the "plug" of the plaque or by rupture of the plaque, both of which produce symptoms of stroke, heart attack, or muscle pain in the legs. It's not primarily the high levels of the "wrong" cholesterols that is the problem, rather it is the effect they have on the blood vessels of the brain, the heart, or the legs.

The good news is that high cholesterol can be treated and recent evidence is persuasive that effective treatment can not only lower cholesterol, but remove plaque that has already built up in the arteries!

If you have a family history of stroke, heart attack, or high cholesterol, your risks for having high cholesterol are higher. This is different than a genetically mediated form of the disease, known as familial hypercholesterolemia, which is passed from parent to child as a defect on chromosome 19 and causes both high levels of cholesterol and makes it harder to clear it from the blood. Symptoms occur very early, sometimes even with heart attacks or strokes in childhood or early adult years. However, this is a rare form and most families are aware of the disease from family history and/or genetic testing. It is also a treatable disease with the medications currently available and described below in more detail.

SUMMARY POINTS

High blood cholesterol (hypercholesterolemia) **doubles the risk of stroke and heart attacks**

High cholesterol is a **totally silent condition**

Many **safe and effective medications** exist to treat high cholesterol

Regular exercise and improved diet can have **a dramatic effect on cholesterol numbers,** particularly in raising HDL ("Happy" cholesterol) levels

Defining This Disease

Hypercholesterolemia literally means high blood cholesterol. Cholesterol is a type of lipid or fat, which is a critical compound the body uses to form cell membranes, an essential part of our body's functioning.

High Density Lipoprotein

Abbreviated as HDL, this is also referred to as "good" cholesterol (think of "H for happy") specifically because higher levels of HDL are protective for stroke, heart disease, obesity, as well as diabetes mellitus type 2. It also removes LDL from the arteries, acting as an LDL scavenger, taking it back to the liver, where it is removed from the body. "Managing Your Lipid Profile" below gives more detail, but patients should seek to get their HDL levels above 50-60 mg/dL.

Low Density Lipoprotein

LDL is often called "bad cholesterol" ("L for lousy"), since levels above recommended targets put patients at significantly higher risk of stroke and heart disease because it leads to plaque and atherosclerosis or "hardening of the arteries." You should target to reduce your LDL level to less than 100 mg/dL.

Triglycerides

Triglycerides are another type of fat that stores and transports excess energy in your diet. Elevation of triglycerides comes from being overweight, physical inactivity, cigarette smoking, excess alcohol consumption, and diets very high in carbohydrates. Triglycerides at normal levels are not a problem (since they serve an important purpose), but high levels of triglycerides are associated with high LDL and low HDL levels. The target for triglycerides is less than 150 mg/dL.

Very Low Density Lipoprotein

VLDL is also a part of our "cholesterol equation," but it is not directly measured. Like LDL, higher levels are bad, but VLDL predictably comprises 20% of the total triglycerides, so it is calculated from triglyceride levels as triglycerides/5.

High cholesterol is a totally silent condition-until it's not!

Managing Your Lipid Profile

What is a lipid profile?
High cholesterol itself doesn't cause symptoms until a lot of plaque has built up, so we must measure it in the blood stream to see if the levels are below or at target or too high.

A lipid profile typically measures or reports the following information:

Total Cholesterol- This measures all forms of cholesterol and typically includes HDL + LDL + VLDL (calculated as 20% of triglycerides). The target is less than 200 mg/dL.

Triglycerides- This is a direct measurement of the amount in the blood of this type of lipid, which should be targeted to be below 150 mg/dL.

HDL- Measures the "good" or "happy" cholesterol directly from the blood with a target of at least 50 mg/dL (although a target of 60 mg/dL is preferable since it is so protective for stroke and heart attack).

LDL – Reports the calculated value of the "bad" or "lousy" cholesterol by using total cholesterol, HDL, and triglycerides. Shoot for target levels of less than 100 mg/dL.

VLDL – Calculated as 20% or triglycerides/5. Published targets are below 40 mg/dL, but shoot for a level below 25.

Cholesterol/HDL Ratio – This is a great tool to calculate the potential risk of stroke or heart attack, based on the ratio of the total cholesterol divided by the "Happy" HDL level.

The average risk varies for men and women:

Risk Ratio	Men	Women
1/2 Average Risk	3.4	3.3
Average Risk	5.0	4.4
2X Average Risk	9.6	7.1
3X Average Risk	23.4	11.0

Because this ratio accounts for important factors, patients should target a ratio of 2.5-3 or less.

Here is a summary of the targets you should aim for to optimize your cardiovascular health:

Lipid Panel Component	Optimal Target Level
Total Cholesterol	< 200 mg/dL
Triglycerides	< 150 mg/dL
LDL	< 100 mg/dL
HDL	< 50-60 mg/dL
VLDL	< 30 mg/dL
Cholesterol/HDL	< 2.5-3

Now let's talk about how to reach these target levels.

Preventing and Treating High Cholesterol

What is good for treatment is also good for prevention and is focused first on exercise, diet, and then on medications if the first two fail. But even if a patient needs medication to reach his target levels, exercise and dietary guidelines should continue to be followed.

Exercise

As high-performance athletes, you know the importance of a regular exercise regimen, which you have followed during your entire career. However, you should maintain a schedule of regular exercise after you have finished playing as well and encourage your family to do so. A regular schedule of both aerobic exercise and strength training can have a dramatic effect on your cholesterol numbers, particularly in raising your HDL ("happy" cholesterol) levels. In fact, many physicians have noted that getting to target HDL levels is tough to do unless their patients exercise regularly.

Generally speaking, 45 minutes of aerobic exercise (use a heart rate monitor to stay in the target zone) 3-5 times a week is needed to have the desired effect. Many patients have seen the best effect if they do so 5-6 times per week. Resistance training also has an effect over and above aerobic exercise, so both should be a part of your regimen (as it undoubtedly already is during the season, but continue it in the off-season, even if at less than the in-season intensity).

Diet

Again, as high-performance athletes you are well attuned to the importance of having the right fuels in the right amounts at the right times to maximize peak performance. If you have been following a strong nutrition regimen during training, many of those food choices are also good for lowering cholesterol (with certain exceptions).

There are 3 fundamental nutrients that make your LDL levels rise:

1. **Saturated fat,** found primarily in animal products, raises LDL more than anything else
2. **Trans-fat**, which comes mostly from foods made with hydrogenated oils and fats like margarine, crackers and fried foods
3. **Cholesterol**, which comes only from animal products

Your body makes all the cholesterol it needs to fulfill its function of transporting fat through the blood to the tissues, so the fundamental dietary recommendations are to:

- Avoid trans-fats (with nearly a fanatic zeal)
- Replace saturated fats in your diet with poly-unsaturated fats
- Increase fresh vegetables, fruits, dietary fiber, and nuts in your diet (which increases helpful plant stanols and sterols, which lower LDL)
- Decrease dietary cholesterol to <200 mg per day

Specific strategies to achieve these recommendations are listed in the EXOS Appendix. A summary of how to adjust your diet to lower LDL and raise HDL is listed below. (Just to be clear, it is a whole lot easier to say what you should do than it is to actually do it-but this is your health, your body, and your mind at risk, so it is well worth it)!

There are also specific foods that reduce total cholesterol and, more importantly, LDL levels, including:

- Oatmeal
- Fish rich in omega 3 fatty acids (salmon, tuna, halibut)
- Legumes (beans and lentils)
- Walnuts, almonds, and pistachios
- Avocados (add slices to your salads)
- Olive oil (rich in mono-unsaturated fatty acids or MUFAs)

Two supplements which are also helpful are CoQ10 (200-400 mg per day) and omega 3 fatty acids (2-3 grams per day). If you are taking statin drugs, be sure to take CoQ10 supplements and tell your doctor.

Change this...	For this LDL Reduction
Saturated Fat to < 7% of diet	8-10%
Dietary cholesterol to < 200 mg/day	3-5%
Soluble fiber to at least 5-10 grams/day	3-5%
Plant sterols/stanols- Add 2 grams/day	5-15%
Weight - lose 10 pounds if overweight	5-10%

Medications

No one wants to take medications if they don't have to, so hit diet and exercise hard. That said, largely because high cholesterol is so common, drug companies have developed many safe and effective medications which lower LDL, total cholesterol, and triglycerides, and which also can raise HDL. Of course, work with your physician to determine if and what dosages and combinations (if necessary) are right for you to hit your target lipid profile levels.

The major classes of medications and how they work:

Statins work by stopping an enzyme that controls the rate at which the liver manufactures cholesterol (a process which occurs mostly at night, strangely enough, so your doctor may tell you to take them at night). They are highly effective at lowering LDL levels, typically by 25-55%, but they also lower triglycerides and raise HDL at least moderately. There are a lot of them, many of which are listed here by their generic and drug names, but more are coming each year:

- **Atorvastatin (Lipitor)**
- **Lovastatin (Mevacor, Altaprev)**
- **Rosuvastain (Crestor)**
- **Simvastatin (Zocor)**
- **Pravastatin-(Pravachol)**
- **Fluvastatin (Lescol, Lescol XL)**
- **Pitavastatin (Livalo)**

Statins are the mainstay of the initial treatment of high cholesterol not responsive to diet, exercise, and weight loss. The primary side effects are rare, but include liver enzyme elevation and muscle damage, so your doctor will monitor not only your lipid panel, but liver and muscle enzymes as well. If you are taking a statin, take CoQ10 supplements (200-400 mg per day), since this dramatically lowers the risk of side effects of statins.

Ezetimibe works by decreasing cholesterol absorption in the small intestine and is often added to statins if the LDL level has improved but is still higher than the target level. Known as Zetia or Ezetrol, this drug typically lowers LDL by an additional 18-25% and has side effects in less than 1% of patients (headache or diarrhea most commonly).

Nicotinic acid or niacin is a water-soluble B vitamin whose use should be supervised by a physician as it lowers all lipoproteins when taken in doses well above the typical dietary recommendations. The FDA removed 2 combination statin-niacin preparations from the market in 2016, so discuss any use of large doses of niacin with your doctor before taking them. When appropriate, they can lower LDL by 5-10% and often raise HDL by the same amount.

Bile acid resins (Welchol, Questran, Colestid) bind with cholesterol-containing bile in the small intestine, which is then eliminated in the stool and can lower cholesterol by 15-30%.

Fibrates (Lipofen, Lopid, TriCor, Lofibra) lower the liver's production of VLDL, so they lower triglycerides, but they also have a modest effect on increasing HDL. They have minimal effects on LDLK levels.

Putting It All Together

Nearly a third of Americans will have high cholesterol at some point in their lives, many of whom develop it in their 20s and 30s, so it is not a disease of old people. It is also silent-until it's not-and leads to 2 times the risk of stroke and heart attack if untreated. If you have family members with high cholesterol, stroke, or heart attacks, you may be at increased risk. The only way to diagnose it is to have blood screening with a lipid panel (usually in conjunction with an annual physical, when the doctor is already drawing blood).

You should know what your lipid panel and cardiovascular risks are and seek to get your levels at or below the targets mentioned above. Start with exercise and a strong dietary plan (which is good for you and the family anyway!) and consult with your doctor to see if medications are needed. If so, they will probably start you on a statin of some kind and increase the dose over time if the target levels aren't hit. They will only add additional medications if needed.

*Remember, this is a silent but treatable condition, but only if you monitor for it! And for what it's worth, I **had** high cholesterol-but not anymore, thanks to exercise, diet and mild medications.*

ADDITIONAL PATIENT RESOURCES

National Heart, Lung, and Blood Institute

Medline Plus

Mayo Clinic

WebMD

Health Line

DISEASES AND CONDITIONS

Obesity

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According to the NIH, nearly 3 in 4 men (74%) are overweight or obese. However, this condition can be overcome by diet, exercise, and medical interventions. This chapter provides an overview of obesity and methods to control it.

Why is this Important?

Many people struggle to maintain a healthy weight and lifestyle. However, "needing to lose a few pounds" greatly differs from the increasing rate of obesity, an excess amount of body fat. The CDC National Center for Health Statistics reports more than one-third of US adults are obese.

Obesity is a disorder and not a matter of laziness. Factors contributing to obesity include genetics, eating and exercise habits, and emotional health.

Obesity is measured using the Body Mass Index (BMI), a calculation based on height and weight. BMI is a person's weight in kilograms divided by the square of height in meters. Generally, a person with a BMI of 25 to 29.9 is considered overweight, and a BMI of 30 or more is obese. Extreme obesity is a BMI of 40 or more.

SUMMARY POINTS

Obesity is a **health disorder**

Obesity is measured using the **Body Mass Index (BMI)**

Obesity **increases risk** of certain diseases and health conditions

A healthy weight loss is **1 to 2 pounds per week**

In addition to potential low energy levels and low self-esteem, obesity results in an increased risk for numerous diseases and health risks including:

- Type 2 diabetes
- Heart disease
- High blood pressure
- Nonalcoholic fatty liver disease
- Osteoarthritis
- Certain cancers: breast, colon, endometrial, and kidney
- Stroke
- High LDL cholesterol, low HDL cholesterol, or high levels of triglycerides
- Gallbladder disease
- Sleep apnea and breathing problems
- Mental illness such as clinical depression, and anxiety

Treatment

Treatment of obesity should correspond to its severity and the presence of other related conditions, such as diabetes and high blood pressure. Lifestyle modifications including diet and exercise are a first step. Eating fewer calories and burning more calories through increased physical activity promotes weight loss. Portion control and calorie counting are helpful weight loss tools. Reducing calories and practicing healthier eating habits are fundamental to overcoming obesity. Many different types of diets claiming fast weight loss have been developed and promoted, but careful adherence to and monitoring of a healthy diet is key to losing weight and maintaining weight loss. Modifying eating habits to include more fruits and vegetables and limiting salt, saturated fats, and sugar helps promote new eating habits that can become sustainable over time. A slow and steady weight loss is considered the safest way to lose weight. A reduction in calories of 500 to 1,000 kcal/day will help achieve a weight loss of 1 to 2 pounds per week. Crash dieting is not healthy, nor does it promote healthy eating habits.

When combined with lower calorie intake, regular exercise can help with weight loss. The American Heart Association recommends at least 150 minutes per week of moderate exercise or 75 minutes per week of vigorous exercise (or a combination of moderate and vigorous activity). Some people prefer group exercise classes or gym memberships for the social aspects, but their hours and locations may inhibit attendance, no matter how strong the intention. Walking is an easy, low cost way to increase exercise. Many cities have implemented self-guided walking maps with routes ranging from 1-5 miles. One way to commit to exercise is to enlist a workout partner. Knowing that a friend or family member is waiting helps reduce excuses for not exercising.



Nutritional Weight Loss Foods	
Beans and Legumes	Beans are filling and a great source of protein. Beans are also high in fiber and slow to digest
Soup	Starting a meal with a 100 to 150 calories cup of broth-based soup may result in eating less
Nuts	Balanced amounts of protein, fiber, and healthy fat. Helps reduce food intake at later meals
Fruit	Raw fruit has fiber
Lean protein (not processed)	Lean beef and chicken breasts are high in protein
Eggs	Eggs are nutrient dense
Leafy greens such as kale, spinach, collards, swiss chard	Low in both calories and carbohydrates, loaded with fiber
Salmon	Loaded with high quality protein, healthy fats, and nutrients
Tuna	Low-calorie, high-protein food
Cruciferous vegetables such as broccoli, cauliflower, cabbage, and brussel sprouts	High in fiber and contain some protein
Whole grains: oats, brown rice, and quinoa	Contain fiber and protein

Medications

There are several prescription medications on the market to help treat obesity. Commonly prescribed weight-loss medications include Lorcaserin (Belviq), Phentermine and Topiramate (Qsymia), buproprion and naltrexone (Contrave), and liraglutide (Saxenda). These drugs are designed to reduce appetite and help prevent overeating. Common side effects of these medications include headache, dizziness, nausea, rapid heartbeat, and constipation.

Orlistat (Xenical) is a prescription medicine that prevents some of the fat calories from being absorbed by the intestines. Patients using Orlistat cannot have more than 30% fat in their reduced calorie diet. Due to the elimination of undigested fat, Orlistat increases the number of bowel movements and may change their consistency. OTC Orlistat (Alli) contains half of the medicine that is in Xenical.

Beware of supplements and herbs promising rapid weight loss. These products are not regulated by the FDA and may cause harmful side effects.

It is important to remember that weight-loss success after surgery requires a commitment to healthy eating and exercise habits.

Combating obesity requires that therapeutic regimens, including diet and exercise, be maintained indefinitely.

Weight Loss Surgery

Common weight-loss surgeries include:

- **Gastric bypass surgery**
  During gastric bypass surgery, the surgeon creates a small pouch at the top of the stomach. The small intestine is cut below the main stomach and connected to the new pouch. Food and liquid flow directly from the pouch into this part of the intestine, bypassing most of the stomach, reducing the amount of calories and nutrients the body absorbs.

- **Laparoscopic adjustable gastric banding (LAGB)**
  With Laparoscopic adjustable gastric banding (LAGB), the upper part of the stomach is separated from the lower with an inflatable band. The band is pulled tight to create a tiny channel between the two pouches. The band keeps the opening from expanding, limiting the amount of food that can be eaten. LAGB is generally designed to stay in place permanently. This procedure does not involve any cutting or stapling inside the stomach.

- **Biliopancreatic diversion with duodenal switch (BPD)**
  During this procedure, a large part of the stomach is removed, leaving a small pouch which is then connected to the last part of the small intestine, bypassing other parts of the small intestine. This surgery is considered high risk because the body has a difficult time absorbing nutrients post procedure; it is typically only performed on patients with a BMI of 50 or higher.

- **Gastric sleeve**
  Gastric sleeve is a procedure where part of the stomach is removed to create a smaller reservoir for food. It's a less complicated surgery than gastric bypass or biliopancreatic diversion with duodenal switch.

ADDITIONAL PATIENT RESOURCES

National Institutes of Health (NIH): Overweight and Obesity

Centers for Disease Control and Prevention

WebMD

National Institutes of Health Guidelines on Overweight and Obesity: Electronic Textbook

American Heart Association

DISEASES AND CONDITIONS

Peripheral Neuropathy

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Catherine Alessi, MD

Neuropathy causes weakness, numbness, and pain due to nerve damage. This chapter describes the different body locations where the condition can occur as well as methods to treat it.

Why is this Important?

Neuropathy is a general term for a process that affects the peripheral nervous system. It can result in weakness, numbness, and pain. Evaluating the potential cause while treating the symptoms and the associated condition can improve athletic performance and improve long-term health.

The human nervous system consists of the central nervous system (brain and spinal cord) and the peripheral nervous system. The peripheral nerves transmit signals to and from the central nervous system. Together they form an elaborate network of wire-like fibers that transmit information regarding sensation in the skin and joints while also sending signals from the brain regarding the need for muscle contraction.

The peripheral nerves consist of an outer layer of insulation known as myelin. The myelin protects the inner part of the nerve called the axon.
There are three basic types of traumatic injury to a nerve:

1. Compression of the myelin typically occurs when leaning on or striking a nerve. These symptoms usually resolve over minutes or hours.
2. More severe pressure or penetrating trauma will disrupt the axon and require a longer time for symptoms to resolve.
3. The most severe injury causes the nerve to be severed entirely.

Many people believe that when a sensory nerve is injured, it will result in complete sensory loss, but this is often not the case. Injured sensory nerves will typically transmit misinformation called paresthesia. These abnormal sensations are typically described as burning, crawling, tingling or “pins and needles.” They can escalate from being an annoyance to debilitating.

Nerve injury can also result in muscle weakness due to inability of the nerve to communicate with its designated muscle group. Muscle atrophy (wasting or loss of muscle tissue) can follow prolonged periods of injury.

SUMMARY POINTS

Neuropathy can result in **weakness, numbness, and pain, sometimes severe**

Nerve damage can be caused by both **trauma and disease**

Diagnosis is made by a **qualified physician**

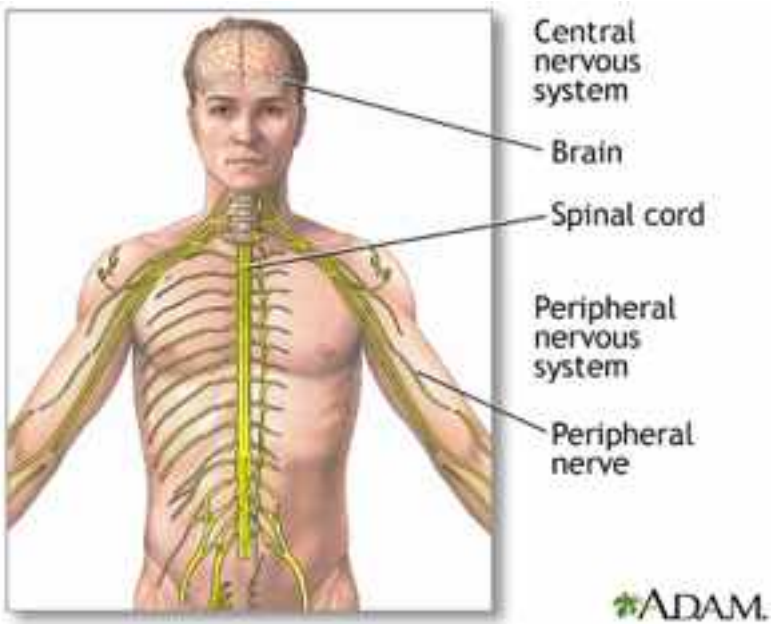
Any player with symptoms of intermittent or **persistent sensory difficulties or weakness** should be evaluated and followed carefully to **avoid further damage** and allow adequate time for healing

Distribution of Symptoms

Radiculopathy: Injury of the peripheral nerve closest to the spinal cord involves the nerve root. This type of injury may result in the loss of function of multiple nerves and muscles that coincide with the specific root involved. A structural injury to the spine is often the cause.

Plexopathy: After emerging from the spinal cord, the nerve roots enter a "junction box" where the roots are reorganized into trunks, cords, and eventually nerves. Injury to the plexus is often related to direct trauma or penetrating injury.

Mononeuropathy: Injury to a single nerve in the upper or lower extremities will produce symptoms in a discrete area of sensation and strength.



Polyneuropathy: Also known as peripheral neuropathy, polyneuropathy affects multiple nerves in the extremities. It is usually caused by a metabolic problem, such as diabetes, vitamin deficiency or a medication side effect.

Diagnosis of neuropathy is made by first having a careful neurologic history and examination performed by a qualified physician. Based on these findings, an electrodiagnostic examination is typically performed. This study, commonly referred to as an EMG, consists of two parts: the nerve conduction study and the electromyographic study.

During the nerve conduction study, a slight amount of electrical charge is applied to the nerve. The speed and intensity of how the charge is conducted along the nerve is measured to determine if there is injury, the type of injury and the exact location of the injury.

The electromyographic portion of the study consists of inserting a small needle electrode into a muscle and analyzing the electrical potentials in the muscle both at rest and with contraction. This portion of the exam shows how well the nerve is communicating with the muscle and will help determine the severity as well as the chronicity of injury.

Common Injuries

Burners and Stingers: These are descriptive terms for the symptoms experienced with injury at the level of the nerve root or the brachial plexus. A burning sensation or sharp pain will radiate down the upper extremity. The injury is typically due to sudden compression of the shoulder, or stretching of the plexus, when making a tackle or being tackled. In addition to the sensory symptoms, there may be weakness throughout the extremity. This is often referred to as a "dead arm."

Symptoms may resolve in minutes or persist for hours or days. Repeated injuries in a short period of time may lower the threshold for future injury. If symptoms and physical findings persist for days, imaging of the spine should be considered.

Although there is no reliable data to predict when it is safe to return to play, the general assumption is that a player can return when symptoms have resolved.

Ulnar Neuropathy: The ulnar nerve is the only nerve located on an extensor surface of the body. It is most susceptible on the surface of the elbow where it passes through a groove and is vulnerable to compression when performing daily activities that involve leaning on the elbow. This part of the nerve is sometimes referred to as the "funny bone." The ulnar nerve can also be commonly damaged at the wrist as it runs through a canal, making it susceptible to injury from repetitive trauma or fractures.

Symptoms involve pain and abnormal sensations that radiate from the elbow or wrist to the ring and pinky fingers of the affected hand. Grip weakness can often be part of the presentation.

Typical injury is related to direct trauma at the elbow or wrist or overuse through repeated flexion and extension of the elbow or wrist. Overuse injuries are most common in activities that require throwing.

The most effective treatment is protecting the nerve from further injury by applying an elbow pad. This will allow the nerve time to repair itself. If injury is more severe or symptoms persist, surgical decompression and/or transposition (moving the nerve to the more protected flexor surface) may be indicated.

Median Neuropathy: The median nerve is vulnerable to injury at the elbow and wrist either by direct compression or overuse. The most common site of injury is at the wrist where it passes through the carpal tunnel. This is condition is often referred to as "carpal tunnel syndrome." Typical symptoms include sensory loss or distortions in the thumb, index, and middle digits. Weakness is noted with difficulty manipulating shirt buttons or small objects. Symptoms are often worse at night and improve with motion such as shaking the hands.

A wrist brace with a firm support on the flexor surface of the wrist will often expedite recovery. Persistent symptoms may require opening the carpal tunnel to avoid further compression.

Lateral Femoral Cutaneous Neuropathy: The lateral femoral cutaneous nerve is a purely sensory nerve that transmits impulses from the lateral thighs. Injury is associated with sudden flexion of the hip resulting in compression of the nerve in the groin. It is also commonly seen in overweight people who wear tight garments. Lateral femoral cutaneous neuropathy is often an early sign of diabetes or other metabolic abnormality.

Symptoms include an intense burning sensation or pain on light pressure over the lateral thigh. This is often followed by sensory loss restricted to a discrete area.

Treatment involves non-narcotic pain relief in the form of topical anesthetic creams or other medications used to treat neuropathic symptoms.

Common Peroneal (Fibular) Neuropathy: The common peroneal nerve passes behind the knee then wraps around the neck of the fibula bone where it is susceptible to direct compression. Most people have had this nerve compressed after crossing their legs for an extended period.

Symptoms include sudden numbness of the foot and inability to flex the ankle resulting in a "foot drop." Repetitive injury can cause permanent symptoms.

Careful evaluation of persistent symptoms is imperative before returning to sports. The possibility of a compartment syndrome should be considered. Treatment includes protecting the nerve and consideration of decompression if a source of injury is identified. A foot brace known as an ankle-foot orthosis (AFO brace) may also be indicated as a walking aid to keep from tripping over the foot until fully healed.

Polyneuropathy: The initial symptoms for polyneuropathy include weakness and sensory changes in a distribution that encompasses the hands and feet initially, but can also extend upward to involve more of the extremities. This pattern is often referred to as a "stocking and glove" distribution.

In industrialized countries, polyneuropathy is most commonly seen in association with diabetes and alcohol use. It can be progressive and result in severe weakness and sensory loss if the underlying cause is not addressed. A thorough neurologic evaluation of polyneuropathy is imperative.

A significant amount of time may be necessary for a nerve to fully heal since damaged nerves repair themselves anywhere from 1-5 millimeters per day, depending on the size.

Any symptoms of intermittent or persistent sensory loss or weakness in an active or former player should be evaluated and followed carefully to avoid further damage and allow adequate time for healing.

ADDITIONAL PATIENT RESOURCES

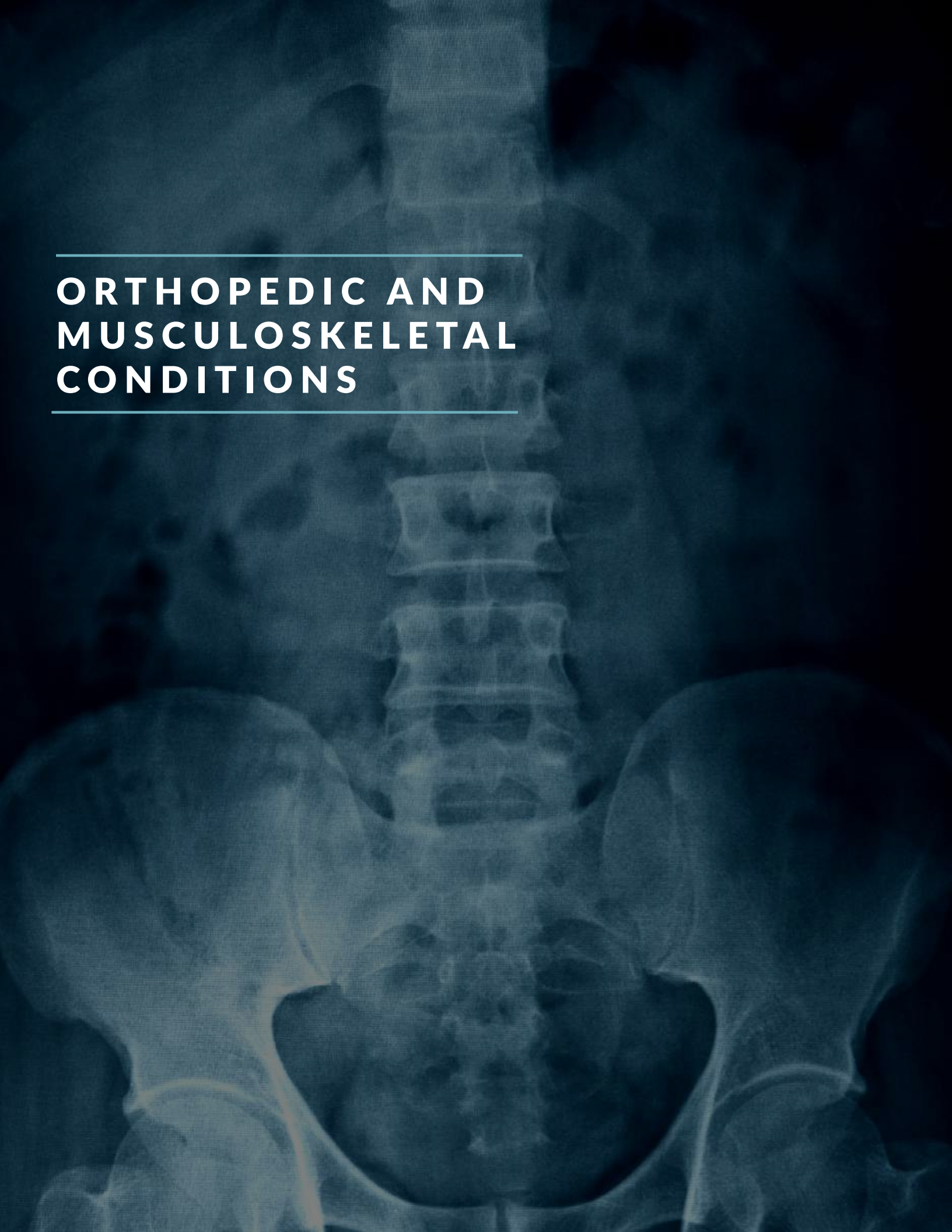
WebMD

National Institute of Neurological Disorders & Stroke

Healthline

American Academy of Orthopaedic Surgeons: Elbow injuries in the throwing athlete

American Academy of Orthopaedic Surgeons: Burners & Stingers



ORTHOPEDIC AND MUSCULOSKELETAL CONDITIONS

ORTHOPEDIC AND MUSCULOSKELETAL CONDITIONS

Osteoarthritis: General Concepts and a Focus on the Hand/ Wrist and Shoulder

Leon Scott, MD, *Vanderbilt University Medical Center*

Osteoarthritis (OA) is a degenerative, "wear-and-tear" process that affects the joints. This chapter will focus on OA of the hands and shoulders, and details the symptoms and various OA treatment options.

Why is this important?

Each of our joints is constructed with bone, cartilage, and a fibrous capsule to provide smooth movement and cushioning. Osteoarthritis (OA) is a degenerative, "wear-and-tear" process of these structures that is associated with pain, stiffness, decreased function, local inflammation, and even bony spurs. We don't know exactly what starts the process of OA, but the risk factors include genetics, advancing age, obesity, inactivity/muscle deconditioning, and trauma. There is even data suggesting that simply the lifetime of participation in contact sports, like football, increases your risk of OA and decreases the age at which you get it.

OA may affect your hands, shoulders, hips, knees, spine/back, and all other joints. This chapter will focus on the hands and shoulders.

Hand osteoarthritis

OA in the hands is associated with stiffness and pain with movement after being still for prolonged periods. In the fingers, the symptoms are common in the two joints of the finger or single joint of the thumb. OA is also common in the base of the thumb and wrist. This pain develops gradually over time, and is not immediately associated with a single traumatic injury the causes swelling, bruising, or inability to move the wrist or fingers. However, individuals with OA in the hands are more likely to have flares or stiffness and pain if they do injury an already arthritic joint in the hand.

Stiffness and pain in the knuckles, also known as the metacarpal phalangeal (MCP) joints, with deformity of the hand and the appearance of the fingers dislocating at the MCP joint is usually

SUMMARY POINTS

Osteoarthritis (OA) is a **common joint disease** associated with **pain, stiffness, decreased function, and local inflammation**

OA may affect **hands, shoulders, hips, knees, spine/back, and all other joints**

OA treatments include **non-pharmacological tools, pharmacological tools, and surgery**

associated with a different forms inflammatory arthritis, like rheumatoid arthritis or lupus.

Functionally, you may experience the symptoms of OA as difficulty gripping items tightly, turning keys, and holding pens while writing.

Physical Examination

The examination of your joints may demonstrate stiffness and limited range of motion. When a doctor looks at your hands, s/he may find bony bumps on the finger joints. These are called Heberden's nodes or Bouchard's nodes. They are associated with bony spurs and thickened soft tissue under the skin.

Your doctor does not need to obtain x-rays in all cases, but with recent flares in pain and stiffness and after trauma, x-rays are helpful for ruling out fractures.

Treatment for hand OA

Treatment of OA around the body revolves around non-pharmacological tools, pharmacological tools including nutritional support, and possibly surgery. Work with your healthcare provider to determine what combination of these tools may be helpful for your hand OA.

Non-pharmacological tools include strengthening exercises that protect and support the arthritic joints, braces, and heat/electrical therapies. Although they all have limited levels of success alone, they can be part of a larger program that gives you control over pain, stiffness, and function. Table 1 highlights the tools that have been studied the most completely for treating hand arthritis.

Table 1

Non-pharmacological tools for hand osteoarthritis

Beneficial tools

- **Exercise:** Home strengthening programs from a certified hand therapist
- **Exercise:** Yoga
- **Bracing:** Bracing of the base of the thumb (Trapeziometacarpal joint)
- **Other:** Heat pools (heated water, balneotherapy, and paraffin baths)
- **Other:** Tens unit glove

Tools without benefit

- **Bracing:** Hand compression glove
- **Other:** Magnetic and copper bracelets provide no benefit

Pharmacological tools include over-counter medicines, nutritional tools and prescription medicines. Currently, none of these tools are proven to stop or reverse the process of OA. However, they can help reduce pain and improve function.

Nutritional supplements

Omega 3 fatty acids
Turmeric/Curcumin domestica
Vitamins D and K
Glucosamine & Chondroitin Sulfate

The category of nutritional supplements has not been studied as rigorously, or used as frequently by physicians for OA as other treatments. However, the following things are known. The combination of glucosamine and chondroitin sulfate has been shown to reduce pain in knee OA, most consistently in severe knee OA. Chondroitin sulfate alone has been shown to provide a small improvement in pain for hand OA in a single

study. Unfortunately, people in the study still required the same amount of other over-the-counter pain medicine each day, suggesting the chondroitin sulfate did not create a truly meaningful difference. The average benefit of these tools in research of OA across the body is less than a single point of improvement in pain and function on a 10-point scale. On average, one point of benefit is needed before most people report a noticeable difference.

Nutritional research shows that turmeric works like non-steroidal anti-inflammatory drugs, like ibuprofen. A specific extract of turmeric, Curcumin domestica, may provide up to 1.5-points of improvement in pain and function on a 10-point scale when evaluated in knee OA. This has not been tested in hand OA.

Although omega-3 fatty acids, vitamin D, and other nutritional tools are gaining popularity for OA, there is no strong evidence supporting their benefit.

Talk with your primary care or orthopedic healthcare providers if you have questions about nutritional supplements. One piece of advice when scheduling your appointments: tell the schedulers that you have questions about these tools so that the healthcare provider can be more prepared to discuss them.

Over-the-counter oral analgesics (pain-reliever)
Acetaminophen (Tylenol) is a common pain reliever that works by inhibiting the development of a group of molecules, called prostaglandins, that signal pain. Although it is considered a safe medicine, and is used in numerous over-the-counter counter pain, cough/cold, and headache medicines, users must pay attention to the dosing instructions to avoid exceeding the recommended daily amounts, which risks injury to the liver.

When taken daily, the average effect is less than one point of improvement in pain and function on a 10-point scale. These numbers were derived from research on knee OA, not hand OA.

Over-the-counter oral non-steroidal anti-inflammatories (NSAID)
Ibuprofen (Motrin, Advil)
Naproxen (Aleve)
Aspirin

These medicines inhibit the cyclooxygenase (COX) enzyme systems in the body that produce the pain signal prostaglandin in the area of injury. They also travel through the blood, affecting the similar COX enzymes in the stomach and blood stream. Although they are effective at reducing arthritis pain, on average a 2-point improvement on a 10-point scale

within the first day of use, they may cause increased blood pressure, prolonged bleeding for patients on blood-thinners, and abdominal pain associated with irritation of the stomach lining.

Over-the-counter topical NSAID
10% Trolamine Salicylate (Aspercreme)

This topical medicine has been shown to have fewer effects on the stomach and fast action for pain control. Any topical medication may lead to local redness to the skin. This topical NSAID has not been compared to oral NSAID, but it has been compared to placebo. On average, peak improvement is within 35 minutes and can last over two hours. Unfortunately, we don't know enough to say how much better a person should anticipate feeling on a 10-point scale comparison.

Over-the-counter topical complementary analgesics
4% lidocaine gel (Found in specific preparations of Aspercreme, Lidocare and Icy/Hot)
Capsaicin
Arnica
Menthol

These tools use non-prescription strength medicines that modify how we perceive pain (Lidocaine, Capsaicin, & Menthol) or reduce local inflammation (Arnica). The appeal for some of these chemicals is that some can be produced with organic methods. Many people believe this makes them safer, but this is not proven. Whether these active ingredients are organic or not, they are the same chemicals. However, organic and inorganic products may have different inactive ingredients. Individuals may have different reactions to these ingredients when choosing between organic and inorganic preparations.

There is no strong data to tell us how much better someone should expect to feel after using these medicines. At best, the American College of Rheumatology makes a conditional recommendation to use Capsaicin for hand OA.

Prescription non-selective oral NSAID
Indomethacin
Ketorolac (also available in an intramuscular injection, Toradol)

Although these medicines are used to help address pain, especially forms of inflammatory arthritis like gout, they are not commonly used for osteoarthritis. They are known to have high risk for stomach irritation. They are also avoided in people with known issues with kidney function.

Prescription topical non-steroidal anti-inflammatories
- 1% Diclofenac

Topical NSAIDs help provide pain relief within the hands similar to oral NSAIDs. Most are tolerated better by patients because of fewer cases of stomach irritation. As with most topical medicines, local redness and irritation is the most common side effect.

Corticosteroid injections
-sones/stones/lones (Hydrocortisone, Methylprednisolone, Triamcinolone, etc.)

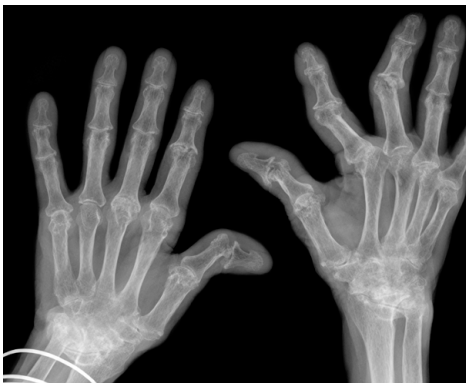
If oral and topical medicines lose their affect, many physicians will recommend steroid injections. They can be provided in any joint of the hand and wrist. When evaluated for knee arthritis, steroid injections provided an average of 2.5-points of improvement in pain and function on a 10-point scale. This effect is greatest at 2 weeks and begins to taper back to baseline between 4 and 12 weeks. Although many physicians limit the use of NSAIDs immediately after a steroid injection, shortly thereafter the use of additional NSAIDs and analgesics may provide additional improvements to pain and function.

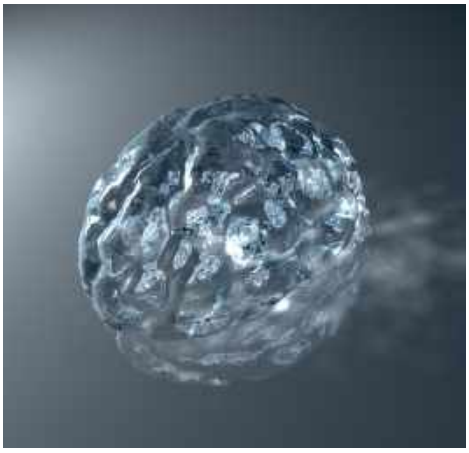
Clearly, these injections are not cures but can be very helpful if a major event is coming up. I often use these tools for pain control before important personal events so that a patient can enjoy life and not be as concerned about their arthritis.

Corticosteroids must also be used safely. Healthcare providers use sterile processes to avoid infection. Steroid that leaks out of the joint into the surrounding soft tissue may cause skin pigmentation, skin lightening, or dimples associated with dissolving local fat cells. Injections into the joint are known to increase blood pressure and blood sugar by varying amounts over the first 3 days. Patients with hypertension and diabetes must be informed on how to respond to elevated test values. Approximately 1% of people also experience facial flushing that resolves within 24 hours. This is harmless, but will frighten any patient not previously informed. Other rare side effects include menstrual bleeding, short-term emotional behavior changes, a possible temporary increase in pain associated with steroid crystalizing in the joint, rupture of local tendons, and severe allergic reactions.

Hyaluronic acid injections
Euflexxa
Synvisc
Orthovisc

Another injectable treatment option is called Viscosupplementation. It uses a material called hyaluronic acid, which is produced in the knee joint naturally. Although it is a structure found in healthy cartilage,





the injections do not directly rebuild cartilage. The material does help improve the environment in a joint, directly lubricate the joint, and provide further cushioning. These changes are thought to help reduce the local inflammation in the cartilage associated with OA, reducing pain and improving function. The injections are provided either as a single dose or as a series of up to 5 doses.

Studies have shown between less than 1 point and up to 1.5-points of improvement in pain and function on a 10-point scale between two and 12 months out from a series of injections. Although the benefit may not be as large, the benefit may be more durable than corticosteroids.

Often, these treatments are not recommended by insurance because of the average marginal benefit, and higher price. Practically, this means you do not get a discounted price that insurance companies often negotiate. Ask your healthcare provider's office staff for the expected price. Do not pay a large, often inflated, price for a series of multiple injections unless you think it is worth the possibly small benefit.

Complications are rare, but the most concerning is an allergy to the injectant. Individuals who are allergic to eggs or chicken are counseled carefully as older forms of hyaluronic acid were prepared from rooster combs.

Experimental injections
Platelet-rich plasma (PRP)
Prolotherapy (Non-Surgical Ligament & Tendon Reconstruction & Regenerative Joint Injection)
Stem-cell injections

This category of treatments is not readily available with every primary care or orthopedic office. This is because they often do not have physiological reasons for providing benefit (prolotherapy), they require extra procedures including blood draws or fat-cell/bone marrow aspirates (PRP and stem cell injections), or they have a lack of scientific support from either clinical research or decades of clinical use.

One of these procedures, PRP, is developing more and more clinical research to support it. The effects for knee OA are between 1 and 3.5-points of improvement in pain and function on a 10-point scale between 6 months and a year from the initial injection. More research will be needed to refine the variability and these benefits before clinicians become comfortable using this tool and other joints around the body including the hand.

Research on stem-cell injections is actively underway, but current data does not support their ability to stop or reverse general OA. There is a role for stem-cells in single "pot-hole" injuries of the cartilage in joints. However, the "pot-hole" injuries are not treated with an injectable form of stem cells; they are implanted surgically.

Surgery
Surgical treatments for hand and wrist arthritis are dependent on the location of the arthritis. Depending on the location and progression of OA in the hand or wrist, the surgical options include variations on bone removal (carpectomy), joint fusion, and joint replacement (arthroplasty). There are many variations that will require a discussion with an orthopedic surgeon who specializes in hand surgery.

Shoulder OA

The shoulder complex includes the collar bone (clavicle), shoulder blade (scapula) and the arm (humerus). Together these three bones and supporting muscles work together to give the upper extremity great mobility. The true shoulder joint (glenohumeral joint) is the ball and socket component of this complex, and is responsible for approximately 2/3 of the mobility. The humeral head, the beginning of the arm, is the ball. The glenoid, a component of the shoulder blade, is the socket. It is more like a sideways golf-tee, providing little support to hold the arm in place. That responsibility is passed to the soft tissue and muscle structures around the shoulder, including the labrum and the rotator cuff.

Similar to the hand, shoulder OA is associated with stiffness and pain with initial movement, limiting daily function. OA can also occur in two other joints of the shoulder complex, the AC (acromioclavicular joint) and the SC (sternoclavicular) joint.

This dysfunction develops gradually over time, and is not the immediate result of a single traumatic injury. It causes swelling, bruising or inability to move the shoulder. However, the risk factors for developing shoulder OA include previous fractures and dislocations involving the joint surface (post-traumatic arthritis), as well as injuries to the muscular cuff that stabilize the shoulder, the rotator cuff (rotator cuff arthropathy).

Examination

When a medical provider examines the shoulder, they will evaluate for range of motion, pain with provocative tests, and strength. In part because the shoulder is reliant on soft tissue structures to maintain stability, many of these tissues are stressed during shoulder OA, and they are also injured. Often, shoulder OA presents with associated tendonitis, bursitis, strains, and sprains.

In addition to certain exam maneuvers being limited or painful, a provider may find tenderness to touch, weakness, popping and grating (crepitus).

Your doctor does not need to obtain x-rays in all cases, but with recent flares in pain and stiffness and after trauma, x-rays are helpful for ruling out fractures.

The risk factors for developing shoulder OA include previous fractures and dislocations involving the joint surface, as well as injuries to the muscular cuff that stabilize the shoulder, the rotator cuff.

Treatment for shoulder OA

The treatment of shoulder OA has many variables. The American Academy of Orthopedic Surgeons has led the medical community on creating guidelines for treating arthritis. Many of the recommendations are inconclusive or limited, especially with non-surgical options.

Non-pharmacological tools

Physical Therapy

Unlike OA of the knee and hips, there are no research-based recommendations to use strengthening, massage, joint mobilizations/manipulations, heat, electrical stimulation, or other modalities to improve function for someone with shoulder OA. This is because of the lack of structured research in this area. Many practitioners, including myself, assume that any opportunity to strengthen the shoulder complex, balance contribution of supporting structures, and improve movement habits is helpful to regain and maintain function.

Some studies of individual cases have shown 2.5 to 3.5-points of improvement in pain and function on a 10-point scale when patients completed physical therapy for 4 weeks, with results that lasted for 6 months. The data for knee arthritis, which is very well studied, only reports a 1.5-point average improvement, but the knee data also included individuals that may not have completed all of their therapy sessions. Individual case studies always run the risk of demonstrating results that are out of the ordinary for average expectations.

Pharmacological tools

The same medications described in the hand OA section are also used for shoulder OA. Please refer to the previous sections for information. Unfortunately, there is no strong evidence suggesting certain oral or topical treatments will be better at reducing pain and improving function for shoulder OA.

Corticosteroid injection

-sones/stones/lones (Hydrocortisone, Methylprednisolone, Triamcinolone, etc.)

Similar to other pharmacological tools, there is no structured research investigating the benefits of shoulder joint injections. General thoughts on corticosteroid injections are including in the hand OA discussion. However, the average benefit reported for other joints have been 2.5-points of improvement in pain and function on a 10-point scale that peaks at two weeks, then slowly wanes between weeks four and twelve.

The difference for shoulder OA is that steroid injections can often be split between the actual shoulder joint, and other areas around the shoulder where associated tendonitis, bursitis, and chronic strains/sprains are found. The following ailments are associated with specific treatment locations (Table 2). Often, the injections are done with imaging, like ultrasound, to confirm the steroid is being placed in the correct location.

Table 2

Common locations for shoulder steroid injections	
Shoulder OA (glenohumeral) Glenohumeral intraarticular injection	**AC joint arthritis** AC joint injection
Subacromial impingement/bursitis Subacromial bursa injection	**Weak external rotation with shoulder pain** Suprascapular notch injection
Biceps tendonitis Bicipital sheath injection	

Hyaluronic acid injections

Euflexxa
Synvisc
Orthovisc

Another injectable treatment option is called viscosupplementation with hyaluronic acid. A summary of these tools is in the hand OA section. These injections have more evidence for knee OA, with mild, but significant improvements in pain and function for 6 months. A single research study looked specifically at the use of these injections once per week for three weeks in shoulder OA, and found close to 2.0-points of improvement in pain and function on a 10-point scale for 6 months. Although the study has many opportunities for bias, hyaluronic acid injections still earned a limited recommendation from the American Academy of Orthopedic Surgeons.

Often, these treatments are not recommended by insurance. Practically, this means you do not get a discounted price that insurance companies often negotiate. Ask your healthcare provider's office staff for the expected price. Do not pay a large, often inflated, price for a series of multiple injections unless you think it is worth the possibly small benefit.

Surgical interventions

When conservative, non-operative tools are not enough to improve pain or function for true shoulder arthritis, surgery may be the right option. However, there are numerous surgery options available for shoulder arthritis.

- ***Additional imaging***
  In addition to x-ray, your surgeon may request an MRI to evaluate soft tissue and a CT scan to evaluate the bone in three dimensions. This is often needed when OA has led to degeneration of bony structures that may be used as anchors to support surgical anchors or implants. They can also help identify irregularities in soft tissue that needs repair or removal.

- ***Medical clearance***
  Your surgeon will review your risk for complications in bone healing (e.g. smoking and chronic disease) and may seek clearance from your primary care, specialty (e.g. cardiology), and anesthesia physicians. Ultimately, surgical treatment of OA is elective, and should not be considered if the risks outweigh the benefits.

- ***Recovery***
  The immediate recovery period is focused on ensuring you have support to care for yourself, adequate pain control and minimize the risk for infection near the healing surgical sites.

  In the first 2 weeks, sutures and staples are removed during post-operative visits. In that time, your surgeon will provide you with a rehabilitation program. There may be restrictions on the range of motion you are allowed to attempt in the first four to six weeks based on the type of procedure you decide to pursue. Anticipate not driving for one month. Return to work is based on the risk of injury or infection, the requirements of the work, and the availability of accommodations. Between six and 12 weeks, individuals are getting near full range of motion, but still have limitations in lifting. Typically, it takes four to six months before it is ok to return to physical activities (e.g. tennis and golf). Contact sports and weight lifting are discouraged after shoulder arthroplasty.

- ***Complications***
  Any surgery can have complications, and shoulder OA joint replacements average just under 15% of patients having a complication over 10+ years. These may include loosening or fracture associated with the implant, dislocation, blood clots, infection, nerve injury, and muscle deformity. Nerve injury and muscle deformity are a higher risk based on the type of surgery a surgeon performs. Ask your surgeon about the risk for these complications, and the best methods for minimizing these risks, when you are deciding together on the best surgical option.

My overall recommendation is to work with a surgeon, or surgical group, that has physicians trained in all of these techniques. Not all surgeons that promote their focus on shoulder surgery perform all these procedures regularly. Use this summary as a resource that allows you to ask about each option, and why a surgeon believes you would be a good candidate for one of these procedures over the others.

✓ ***Arthroscopic treatment and debridement:***
The classic tool for treating arthritic joints is a replacement, known as an arthroplasty. There are concerns about how long a joint replacement will last, especially in younger patients who may have heavier lifting requirements, or may be more active.

Although that is not conclusive, most orthopedic surgeons consider using shoulder arthroscopy and debridement as an option for individuals under age 50, with higher activity levels, and who wanted to avoid major surgery. Arthroscopy is the use of cameras inside the joint to perform the surgery, instead of opening the joint up completely, to treat injured tissue.

Some of the procedures include:

1. Removal small bone spurs (osteophytes) and decompressing impinging bony structures
2. Removing loose pieces
3. Smoothing out cartilage and soft tissue flaps
4. Cartilage defect repair procedures
5. Removal of the far tip of the clavicle if there is associated acromioclavicular joint arthritis
6. Tendon releases (tenodesis or tenotomy)

There is no good evidence comparing arthroscopy and debridement to other procedures. Because of this, the American Academy of Orthopaedic Surgeons is inconclusive on its recommendation on these procedures. However, in many reports patients with lower levels of arthritis, and younger patients (< 50 y/o) do report up to 4.5 point of improvement in pain and function on a 10-point scale. Unfortunately, those numbers come from sources with a large opportunity for bias. Older patients have less predictable improvements, with less than one point of improvement in pain and function on a 10-point scale when evaluated over three years from surgery. In 2015, one study showed that over 40% of these patients requested had a shoulder replacement within a year of the debridement. This adds more chance for complications to the patient, and more expenses to the healthcare system.

✓ ***Hemiarthroplasty:***
This procedure is the replacement of only half of the shoulder joint, replacing the ball of the arm bone, the humeral head. Again, the shoulder joint has a ball and socket, with the humeral head being the ball and the glenoid being the socket. When an individual with shoulder arthritis has a sufficiently smooth glenoid, this surgery is often considered. It was thought that it was better for individuals who wanted to return to sports. The American Academy of Orthopaedic Surgeons does not believe that there is convincing evidence that this is the case. In fact, recent comparisons suggest that hemiarthroplasty and total shoulder arthroplasty have similar improvements in pain and function at an average of 5 years out from surgery.

Those evaluations were in individuals who average 61 and 62 years of age, respectively. However, hemiarthroplasty remains one of the more consistently used tools for shoulder arthritis and individuals under the age of 50 because individuals can be converted to a total replacement later if there is any evidence of loosening of the shoulder implant

- ***Total Shoulder Arthroplasty:***
  This is a full replacement of the glenoid and humeral head. This surgery can successfully restore function and reduce pain in the shoulder. In recent studies, when compared to hemiarthroplasty, patients have a slightly higher satisfaction with the total shoulder arthroplasty surgery, and an average of 4 to 5.5-points improvement in pain and function on a 10-point scale. And equivalent numbers of people can return to recreational, non-contact sports including basketball, tennis, and golf.

- ***Reverse shoulder arthroplasty:***
  This surgery is unique because it reverses the usual ball and socket hardware. For reverse shoulder arthroplasty, the ball is on the shoulder blade and socket is on the arm. This technique was developed because some patients develop shoulder OA and have degeneration of the rotator cuff. In order to move the arm up to the side, other shoulder muscles are needed. The reverse shoulder replacement structure allows for those other muscles to do this more effectively.

  Besides patients who have OA associated with full degenerative rotator cuff tears, it is also used if other replacements have failed. Although this is a promising technique, it has only been approved in the United States since 2003. The full life of these implants is still being measured, but results are promising. Current data suggests an average of 4.9-points of improvement in pain and function on a 10-point scale for patients with their first shoulder replacement with rotator cuff deficient shoulder OA. The scores are lower for patients who have a reverse shoulder arthroplasty to replace a failed classic total shoulder arthroplasty (3.0-points), but it is still a procedure worth considering with your surgeon if other options are limited.

ADDITIONAL PATIENT RESOURCES

Arthritis Foundation: OA

WebMD

Healthline: Hand OA

American Academy of Orthopaedic Surgeons: Shoulder OA

American College of Rheumatology

ORTHOPEDIC AND MUSCULOSKELETAL CONDITIONS

Osteoarthritis and the Injury of Joints of the Lower Limb

Mark Theiss, MD, FACS, *Chair, Department of Orthopedic Surgery, Inova Fairfax Medical Campus, Falls Church, Virginia ,Professor of Orthopedic Surgery, Virginia Commonwealth University School of Medicine*

Why is this important?

Years of athletic performance and especially football take their toll on most of the body's joints. Few if any athletes that played many years of contact sports will state that they have no aches or pains coming from one of their joints. This chapter covers the major joints of the lower extremities (hip, knee, foot and ankle) that tend to become symptomatic over the course of years.

The Hip Joint

The hip is considered a ball and socket joint and is normally very stable. The socket is formed by the acetabulum, which is part of the large pelvis bone. The ball is the femoral head, which is the upper end of the femur (thighbone). The hip is rarely dislocated, but if this occurs it is a severe injury with a high risk of developing avascular necrosis and subsequent arthritis. Avascular necrosis is when the blood supply to the ball is reduced or absent due to vascular injury and the ball, which is a living bony tissue, dies and later collapses, causing arthritis.

More common problems involving the hip are simple arthritis or osteoarthritis, which is commonly called wear and tear arthritis. Arthritis is typically associated with pain that is usually in the front of the hip or in the groin. When pain is primarily in the back of the hip, it is usually coming from the lower back from something like a disc herniation even if the back itself is not painful. If the hip is flexed (like in a sitting position) and the leg is internally rotated (the foot is moved outward) and this maneuver causes increased pain, the cause of the pain is very likely to be coming from the hip joint itself rather than from the back. Arthritis is typically seen with a plain x-ray and a MRI is usually not needed to diagnose. If the plain x-rays are normal and the hip pain persists despite treatment, then an MRI of the hip is recommended.

If the pain is on the lateral or outside of the hip, the area is tender to pressure, and is painful to sleep on that side of the body, the pain is most likely due to bursitis or inflammation of the trochanteric bursa. Bursa is a fluid-filled sac near a joint at the outside point of the hip known as the greater trochanter. This will have a normal x-ray and if pain persists with treatment, an MRI of the hip is indicated.

The last common cause of hip pain in the athlete is a tear of labrum. This is like a rubbery O-ring that is attached to opening of the socket or acetabulum. This would have a normal x-ray and

SUMMARY POINTS

Common hip problems are simple **arthritis and osteoarthritis (wear and tear arthritis)**

Noninvasive treatment includes **the use of over the counter NSAIDs and exercise or physical therapy**

ACL (anterior cruciate ligament) and meniscus tear are common football injuries

Common foot and ankle injuries includes **sprains, fractures, and Achilles tendon rupture**

would require an MRI to diagnose. Often labral tears are associated with some degree of arthritis or damage or thinning of the articular cartilage on the inside of the socket or acetabulum or that cartilage which covers the ball or femoral head.

Treatment

Conservative or noninvasive treatment includes the use of over the counter Nonsteroidal Anti-inflammatory Drugs (NSAIDs) like acetaminophen (Tylenol), up to 3000 mg per 24 hours (6 pills of Extra Strength Tylenol), Ibuprofen (Advil) 400 to 800 mg three or four times a day with food, or Naproxen (Aleve) one or two tablets which is 220 or 440 mg twice a day with food. If this is ineffective, then a cortisone injection is usually worth trying for all the above causes of hip pain. A cortisone injection may only give temporary relief, but if there is relief it tells you that the hip itself caused the pain. More recent injection techniques now involve PRP or platelet rich plasma, where your own blood, taken from a blood draw, is spun down in a centrifuge and then injected into the involved joint. An additional injection technique is gaining popularity, where your stem cells, taken from your pelvis, are injected into the involved joint.

Additional conservative treatment involves exercise or physical therapy. The best exercise for the hip will be low impact such a cycling or swimming. When conservative options are ineffective and symptoms are bad enough so that the risk to benefit ratio is in favor then surgery can be considered. For hip arthritis when you are limping all time, taking medication routinely for the pain, and are unable to walk a mile, then hip replacement becomes a logical option. Hip replacement operations usually eliminate all hip pain, restore normal function, except no running advised, and have extremely satisfied patients. For hip bursitis, if conservative measures do not help, then a cortisone injection is usually very effective, although not always permanent.

For a labral tear that remains symptomatic, an injection of local or cortisone may help confirm the diagnosis and be therapeutic. If the pain persists then hip arthroscopy to repair or resect (remove) the tear may be needed. Hip arthroscopy is a surgical procedure that allows doctors to view the hip joint without making a large incision (cut) through the skin. A small camera, called an arthroscope, is inserted into your hip joint. Pictures are displayed on a video monitor, which helps the surgeon guide miniature surgical instruments. A very small percentage of orthopedic surgeons perform hip arthroscopy and you would need to rely on the advice of your orthopedic surgeon to find a skilled hip arthroscopist.

The Knee

Anatomy

The knee is a complex structure composed of ligaments, articular cartilage, meniscal fibrocartilage, and tendons. The main ligaments connect the femur to the tibia and consist of the medial and lateral collateral ligaments, and the anterior and posterior cruciate ligaments. The medial and lateral menisci are C- shaped pads on each side of the knee that function as cushions, provide stability, and help lubricate the joint. The tendons connect muscles to bone and are the motors or movers of the joint to straighten (extend) or bend (flex) the knee joint. Any of these structures can be easily visualized using a Google search, clicking on images. Any of these structures can be injured and are commonly injured playing football. Some injuries can be treated conservatively or non-operatively, but many require surgery in the form of arthroscopic surgery.

Imaging typically starts with a plain x-ray but if significant injury is suspected then an MRI is needed. If you need an MRI make sure that it is done in a machine with 3T (3 Tesla) magnet or the quality of the images will be insufficient to make a proper diagnosis and plan for care. It is beyond the scope of this chapter to go through the diagnosis and treatment for each of these types of injuries, but it will cover several common problems.

Anterior Cruciate Ligament (ACL)

The ACL tear is a common football injury. This ligament prevents the upper tibia from slide forward under the femur or thigh bone. When it is torn, the knee will feel unstable, particularly when running or trying to make a quick cut to the side. It is often injured alone as well as in combination with collateral ligaments and meniscal tear. When torn in a young athlete, the ACL is usually reconstructed using your own tissue, either from the patellar tendon or using your hamstring tendons. This is an arthroscopic procedure and usually has a good outcome.

Meniscal Tear

Only the peripheral 20% of the meniscus has good blood supply and is capable of healing. If torn peripherally, arthroscopic repair is very helpful. If torn where there is poor blood supply, then trimming out the torn portion arthroscopically is a good operation, with a quick recovery.

Arthritis and Degenerative Changes in the Knee

This is a controversial area. Generally, if there is significant arthritis and the joint space is reduced to less than 2 mm, the value of cleaning up a knee with arthroscopic surgery is not likely to help, even when there are significant meniscal tears. In this scenario, using a custom-type brace to unload that area of the knee, inject with cortisone, platelet rich plasma (PRP), or stem cells until it is time for knee replacement are the best options.

The Foot and Ankle

The foot and ankle are frequently injured while playing football.

Sprains

An ankle sprain is a tear of a ligament, a fibrous structure that connects one bone to another and limits the range of motion for that joint. The lateral or outside of the ankle has three ligaments attaching the fibula or smaller leg bone to the talus and calcaneus or heel bone. The front one is called the talofibular ligament and is the most commonly sprained ligament in the body. This ligament is torn when the foot rolls under, stretching or tearing the ligament. The inner or medial side of the ankle has a single fan shaped ligament called the deltoid ligament, which is much less torn. Pictures of these ligaments are easily seen on Google under the image tab. When the ankle injury is a sprain, the x-rays will be negative or normal. When the injury is so bad that one cannot weight bear, then immobilization in a cast or walking boot is needed for a week or two followed by taping or a lace up ankle brace. Taping or a lace up brace should be worn for running sports for at least three months following an ankle sprain.

Fractures

Fractures of the ankle are also common injuries for running sports especially when there is a lot of cutting and contact. When a fracture or break of a bone occurs it can be just a crack without displacement or displaced or out of normal position. Non-displaced fractures can usually be treated with immobilization in a cast or boot. Some can allow weight bearing and some require non-weight bearing for a period up to 6 weeks. Treatment for displaced ankle fractures is surgery where the bone is placed back into perfect position and then held in place with screws and or plates with screws. Usually after an ankle is operated on, the patient is made non-weight bearing for 6 weeks, followed by protected walking. Return to sports normally takes at least three to four months following injury.

Achilles Tendon Rupture

The Achilles tendon is a strong tendon that connects the back-calf muscles to the heel bone and is responsible for pushing down with the toes and forefoot and is critical for athletic performance. In an older individual over forty years of age this is usually treated non-operatively without surgery, but recommendations vary and the decisions should be carefully considered with your doctor. In a younger, high performance athlete, the treatment is usually to repair the tendon. Weight bearing is allowed with a protective brace usually by two weeks. The brace is removed at six weeks but a wedge-shaped heel lift is then worn in the shoe for the next four to six weeks. Return to running is allowed when good strength has returned to the calf, which usually takes three to four months at least. Maximum strength to the repair will occur at about the one-year point.

Physical Therapy

For most of the injuries listed above physical therapy is an integral part of the rehabilitation process. An activity that you can do on your own to accelerate recovery is cycling either on a stationary bike or real bike. I usually tell my patients to start slowly, for about 5 minutes or a time that you know will not hurt you. Ride three times a week, adding one minute more each time and keep the pedal resistance low until you tolerate thirty minutes. Then you can start to simulate rolling hills on a stationary bike or on a real bike shift up and down with the gears every one or two minutes to simulate hills if you are on flat ground. If you are early in the rehab process I recommend heating the involved joint with a heating pad or hot towel, then cycle followed by stretching and finally end with an ice pack. Once you are further along in the rehab process the heat and ice will not be necessary.

ADDITIONAL PATIENT RESOURCES

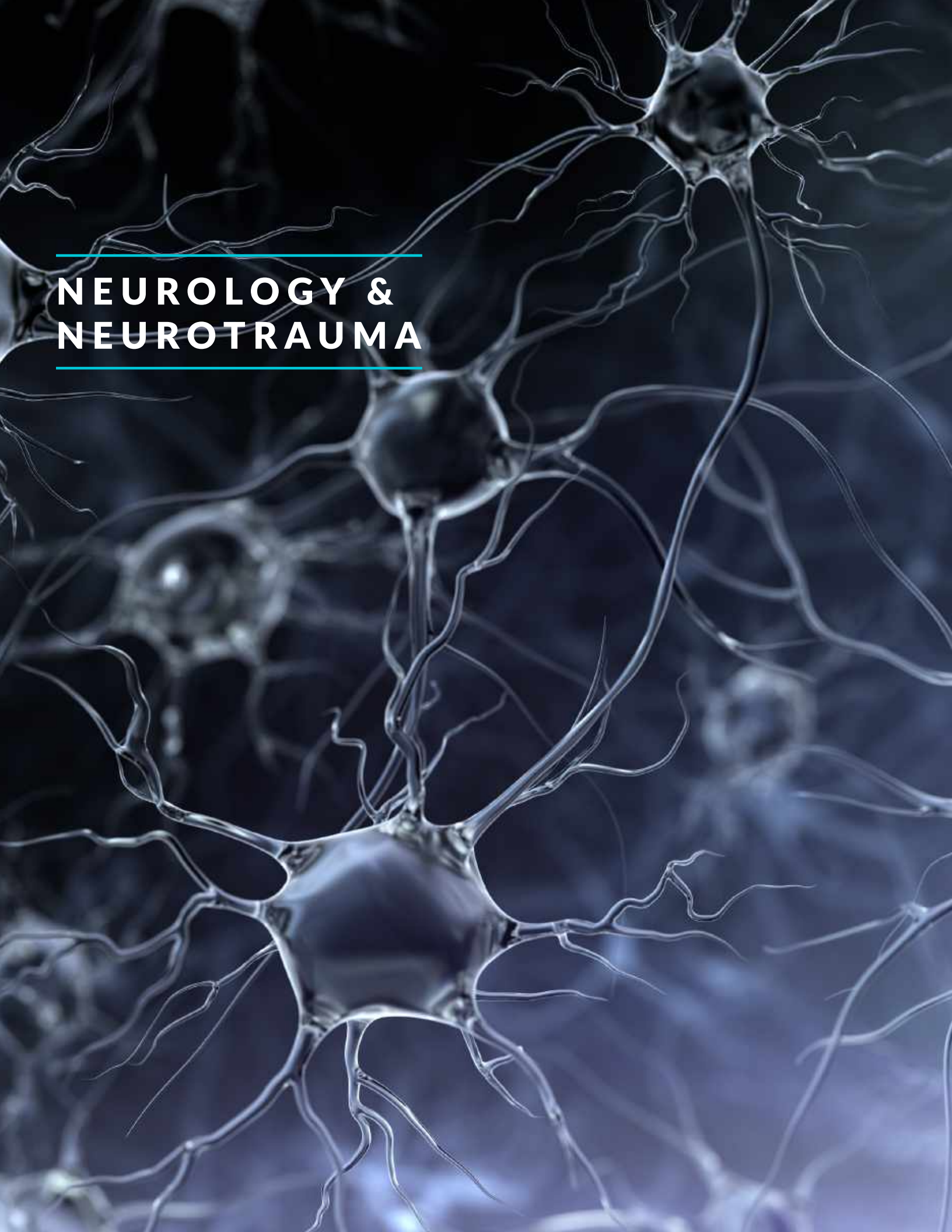
American Orthopedic Foot & Ankle Society

Mayo Clinic Arthroscopy overview

WebMD: knee injuries

Medline Plus: hip injuries

Arthritis Foundation



NEUROLOGY & NEUROTRAUMA

NEUROLOGY

Concussions, Post-Concussion Syndrome and Long-Term Brain Health

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Concussion is a common injury suffered by athletes. This chapter explains concussion injury, symptoms, diagnosis, and treatment. The evaluation, initial management, and return to participation after concussion are subject to strict guidelines negotiated by the NFL Players' Association with the NFL. Those guidelines are discussed in the following chapter. The NFLPA has also developed an 8-minute video on Brain Health and Concussion Education, which is very helpful.

SUMMARY POINTS

Concussion can occur from even a **mild blow, usually to the head,** either with or without loss of consciousness and **can lead to temporary cognitive and other symptoms**

Concussion can occur **from a hit to the head (helmet), a hit to the body or to the ground that causes the head to move quickly**

Symptoms may include **headache, dizziness, balance or coordination difficulties, nausea, amnesia (memory loss), cognitive slowness, light/sound sensitivity, disorientation, visual disturbances, tinnitus (ringing in the ears), problems with sleep, or excessive fatigue**

Only an appropriately-trained and certified clinician can diagnose concussion

No two concussions are the same, even in the same person

Why is this Important?

Simply put, your brain is what makes you, you. It holds your memories, determines your personality, and allows you to be aware of the world around you. There is no more critical part of the human body. Concussions and other types of head trauma can affect how your brain works and how healthy it is. Some effects of brain trauma are temporary, lasting hours, days, or weeks. Other effects can last for years or be permanent. Understanding these complex issues of brain health may seem daunting at first, but the most important concepts are straightforward.

The brain is made of billions of cells, called neurons, which communicate with each other to perform nearly every human function, such as thinking, speaking, listening, and moving. The brain resides inside of the skull in a liquid called cerebrospinal fluid (CSF). Brains grow and develop into our early 20's, creating the connections that comprise who we are. Later in life, there is a natural aging process that causes the brain to lose neurons and become less efficient. Most humans won't notice a decline in function until their 60s or 70s.

Brain function and structure is quite dynamic. This means that if we train our brain, not only do we become better at a given task, but the brain itself may respond by creating new, more efficient connections. We always have the chance to learn and improve our brain's function.

Concussions are a type of brain injury that occurs when the brain moves or stops quickly inside of the skull. If the forces experienced by the brain are significant enough, it interferes with the neurons' ability to work properly and form brain networks. A concussion is not a bruise of the brain and it does not involve bleeding. Episodes of bruising, swelling, or bleeding, can occur and can be serious, but they are rare and not concussions.

It is important to remember that a concussion can occur from a hit to the head (helmet) or from a hit to the body that causes the head to move quickly. Remember that no two concussions are the same, even in the same person. Just because the symptoms are different or they last a different amount of time doesn't mean the injury isn't a concussion. Just as the symptoms are different, the time for recovery may be different as well.

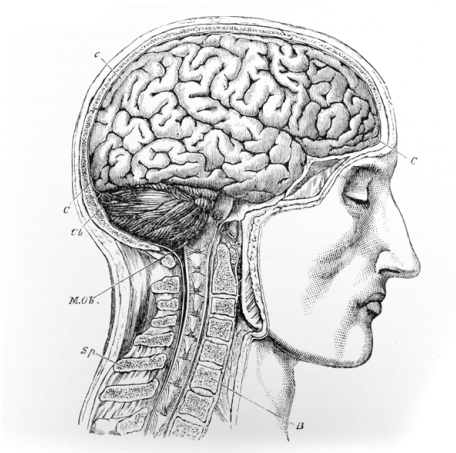
Symptoms of a Concussion

Concussion symptoms typically start shortly after the hit, within seconds or a few minutes, but in some cases, you may not notice effects for several minutes, hours, or even until the next day. The most common early symptoms of concussion are

- **Headache.** Typically, dull or throbbing but may take on a sharp quality as well. It may be mild, moderate, or severe, and may cause sensitivity to light and sound.
- **Confusion or Disorientation.** Especially right at the injury onset, including not having a clear sense of where you are or when it is (at what point in the game or practice it is, for example).
- **Balance or coordination difficulties/Clumsiness.** Most notable with movements that require balance, such as walking or running, or coordination such as throwing or catching.
- **Dizziness.** A feeling that you cannot hold your position in space. You may also feel that the world is moving or spinning, which is referred to as the sensation vertigo.
- **Memory problems/Amnesia.** You may have difficulty remembering what happened before the hit, or since the hit. Sometimes there is a complete loss of memory for a given period and sometimes your memory may be "spotty." Nausea or vomiting. You may feel sick to your stomach or even vomit. Your appetite may also be decreased for some time.
- **Cognitive slowness**. A feeling that things just aren't "connecting" as fast as usual, whether at home or at the practice facility. Assignments may come more slowly than usual.
- **Visual disturbances.** Common problems include "seeing double" or double vision, difficulty following moving objects, and having trouble adjusting to bright light.
- **Tinnitus.** A ringing in the ears, which may be constant or intermittent

Over the next few days, it is also common for other symptoms to develop, including but not limited to: *fatigue, sleep difficulties, depression, anxiety or irritability*.

As a rule, any symptom that involves how the brain works may be caused by a concussion. Getting checked out as soon as possible is key. Concussion symptoms will typically be their worst shortly after the injury occurs, but with proper treatment, most people will experience gradual and progressive improvement from one day to the next.



As a rule, any symptom that involves how the brain works may be caused by a concussion. Getting checked out as soon as possible is key.

Diagnosing a Concussion

Concussion diagnosis is not a simple matter of taking a test on a computer or getting a CT or MRI scan of your brain. Only an appropriately trained and certified clinician can diagnose concussion, after a careful and thorough history and neurological examination. Sometimes the diagnosis is very clear. Other times there may be some degree of doubt. In either case, it's best to be treated as if you are concussed, to err on the side of safety and health.

Your team physician, your personal physician, the team's Independent Neurological Consultant, or certified athletic trainer (ATC) may use certain tools to gather information that may prove helpful in making a concussion diagnosis. Some of these may include:

- **Neurocognitive testing** measures brain functions such as memory, language, and reasoning and can be done either by using a computer (e.g. ImPACT, CogState or others), being interviewed, or by taking tests on paper.
- **Balance testing** is often used and can be very simple, such as being asked to stand a certain way for a certain period.
- **Eye movement testing** examines a complex and fragile aspect of brain function. Controlling the movements of your eyes, especially when you are moving yourself, or you are watching a moving object, is quite often affected in concussion.
- **Symptom checklists** where symptoms are not only recognized but scored for severity.

There are many other appropriate tests or tools that may be used. Regardless of the type, each tool should be used only in combination with the information gathered from the neurological history and examination performed by the physician. Putting everything together and getting a complete neurological picture is the best way to make an accurate diagnosis.

Concussion Treatment and Management

If a concussion is suspected, the first step is to remove the player from participation for their safety and give them a focused neurological evaluation. The physician or athletic trainer should also look for the presence of a more significant brain or neck injury. These are typically ruled out by a careful history and physical examination on site, but sometimes a visit to the emergency department is needed.

The next step is to address symptoms and begin planning for the recovery process. In general, concussion management can be divided into three phases:

1. **Acute rest:** During this phase, the focus is on making the patient comfortable and avoiding additional trauma to the head. The patient should avoid physical and mental exertion that makes symptoms significantly worse. This may also mean avoiding busy environments, such as stores or restaurants, or limiting exposure to TV or computer screens. This phase is typically short, a few days or so, and may not be necessary with many concussions. Recent studies note that complete cognitive and physical rest lasting more than a few days (so-called "cocoon therapy") is not as effective as graded, gradual progression, as noted below.

   Regardless of how mild or severe the symptoms are at first, it is very important to concentrate on getting good sleep, staying hydrated with water, eating a balanced diet and minimizing anything that is making symptoms significantly worse. This is not an injury you can "play through."

2. **Relative rest:** Most people with a concussion will spend a good bit of their recovery in this phase, when it is a good idea to be active with regular activities, while continuing to avoid physical exertion to the point of "working out" or the extremes of cognitive exertion.

3. **Graduated return to participation:** If you go through a typical day of routine activities with minimal or no symptoms, you can begin the graduated return process. This involves going through a staged series of physical and cognitive exertions designed to challenge the brain in an increasing manner. The specifics of this process should be tailored to the individual and determined by a physician with experience in managing concussion.

In general, however, the process starts with simple sustained cardiovascular exertion. Then, more complex exertions can be added that introduce intervals. Agility drills then challenge more athletic aspects of brain function. The mental aspect of playing the sport should then be challenged through game-type drills (without contact). Finally, some controlled contact should be experienced prior to playing in a live game. The specifics of the NFL Return to Participation protocol are listed in the **next chapter** and were written in consultation with the authors of this chapter.

The timing of each stage of this process is variable and should be closely monitored. Before starting each stage, enough time should be given after the previous stage to assess for the development of symptoms.

Remember, the purpose of this process is not to determine when you can play football again. Rather, it is to determine recovery from injury. If a concussion is still present, but not producing symptoms at rest, the staged exertions should be significant enough to potentially produce symptoms, thus alerting your physician to the continued presence of the injury.

Under the supervision of a physician, medications can be used to help manage the symptoms of concussion but are usually stopped before return to full participation.

For headache, it is best to avoid medications in the first 24 hours of the injury. If the headache is bad enough, however, Tylenol can be used. After 24 hours, anti-inflammatory medications such as Motrin or Aleve may also help. Although bleeding inside the skull is rare in the setting of concussion, anti-inflammatory medications are avoided in the first 24 hours because they may make bleeding worse. If a severe headache persists, or the headache is getting worse, bring it to the attention of your physician as soon as possible.

Sleep problems are very common with concussion, including difficulties falling asleep or staying asleep. As well, even if you seem to be getting a good amount of sleep, it may be poor quality sleep and you will still wake up feeling tired. Melatonin can be used to help initiate sleep. Other medications, including prescription medications written by your doctor may also be helpful on a short-term basis.

If nausea is significant, both over-the-counter and prescription medications (Zofran) can help.

Regardless of the symptoms and the medications used to treat them, it is important to not allow medications to cover up symptoms that would otherwise be present when evaluating when to begin the graduated return process.

Additional therapies such as cognitive, ocular, vestibular or cervical physical therapy may also prove beneficial. More detail on these therapies are listed in the Appendix.

Post-Concussion Syndrome (PCS)

The term "PCS" is used to describe the situation in which symptoms, such as headaches, sleep difficulties, and thinking problems, continue even after the concussion itself is over. PCS may last several weeks, months, or even years if not treated properly. It is best to think of PCS not as one particular thing, but rather as a category of problems that all have one thing in common, each case having followed a concussion. As such, there is no clear time frame for when PCS begins. If your physician feels that your concussion is over, but symptoms persist and other causes have been ruled out, then PCS might be diagnosed.

The vast majority of PCS cases have multiple factors contributing to symptoms. Many factors will work to make other factors worse, creating an even larger problem.

Some of the more common PCS factors include:

- **"Unplugged Syndrome"** refers to symptoms that are being produced because the patient has been avoiding physical, mental, and social activities to an unhealthy degree. In other words, doing too little can create problems like anxiety, sleep, headache, and "foggy thinking" or potentially make pre-existing problems worse.
- **Sleep difficulties are common.** Sleep effects can include problems falling asleep, staying asleep, or getting efficient sleep. (See the **chapter** on "Sleep and Sleep Disorders".)
- **Depression or anxiety problems** are very common, either because they were pre-existing problems that have become worse, or as secondary effects of other problems such as headaches, sleep difficulties, lack of exercise, or social isolation. (See the **chapter** on "Mental Health and Performance".)
- **Headache disorders,** especially migraine headache, are common and can be a debilitating component of PCS. It is often necessary to seek the care of a physician with significant experience treating the spectrum of headache diagnoses. (See the **chapter** on "Headaches".)

Diagnosing PCS requires a very thorough, yet focused, neurological history and examination. Like concussion, it cannot be diagnosed with any one test and is most clearly diagnosed by a physician who has experience diagnosing and treating a wide variety of brain diagnoses.

PCS treatment and management

The hallmark of PCS treatment is a coordinated care plan that considers each of the individual factors at play. At the same time, it is important to establish an accurate and healthy approach to symptoms and what each one means. For example, if somebody with PCS is being treated as if they are still concussed, and is being told that every time they develop a symptom with activity they need to rest more, that person will be unlikely to ever recover or at best recovery will be delayed.

Each symptom should be considered and treated, while the relationship between each symptom is also carefully considered. For example, some treatments for headache might make anxiety worse, while some medications for anxiety may increase foggy thinking, and so on.

There are many treatments being offered for PCS that do not have a scientific foundation, such as hyperbaric oxygen therapy, PET scan-based therapies, and many others. Some other therapies may make sense scientifically but have not been shown to be useful when studied carefully. In the end, it's important to be a wise consumer of any treatment. Seek the advice of a medical professional you trust, preferably somebody who does not receive a direct financial benefit from the treatment itself.

Long-term Brain Health

Concussions are temporary and PCS can be treated. There are other effects from brain trauma, however, that may persist throughout life.

Chronic Traumatic Encephalopathy (CTE) has been the subject of research, advocacy, and a Hollywood movie. In the end, some contact sport athletes will have long careers and not develop CTE. Others will have shorter careers and develop CTE. Even some non-athletes will develop CTE. Perhaps most importantly, the relationship between CTE and symptoms during life needs to be carefully considered in each individual.

It is extremely important to keep in mind that CTE is not always the explanation when somebody who played football starts having problems later in life. Every sign or symptom of CTE that is commonly described in the media can also be caused by something else, and from something that is treatable. Even if the symptoms are caused by CTE, it is likely they can be addressed with appropriate therapies.

The key appropriate care and the best possible outcome is to have a comprehensive neurological evaluation to help determine the most accurate diagnosis, as well as the most appropriate course of treatment.

The most important advice is not to assume you have a chronic, irreversible disease simply because you have symptoms. Consult an expert in this field who can do the comprehensive neurologic evaluation and studies necessary to determine your status and the best treatment for it.

The State of the Science

The amount of scientific literature published on concussion, PCS, and the long-term brain health of athletes continues to increase exponentially. We have seen an incredible increase in awareness, education, and policies designed to address these issues. That said, the science is still young. Especially in the realm of long-term brain health, there is likely more to be discovered in the next few years than we know today. It's important to stay informed and seek out updated and accurate information based on what we know.

ADDITIONAL PATIENT RESOURCES

Centers for Disease Control and Prevention

Mayo Clinic

WebMD

Patient

MedlinePlus

NFL Players Association

NEUROLOGY

NFL Concussion Diagnosis and Management Protocol

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Sean C. Sansiveri, Esq. *NFL Players Association*

Concussion is a common injury suffered by athletes. The NFL and the NFLPA have developed a comprehensive protocol for a player's return to participation following a diagnosis of a concussion. This chapter outlines the updates to the Concussion Protocol for the 2017 season and a summary of the protocol and enforcement mechanisms.

SUMMARY POINTS

The Concussion Protocol **is being improved all the time, as new technology and better medical knowledge** becomes available

Punishments are in place for teams **who fail to follow the Protocol and protect the health of players**

Why is this Important?

The NFL Game Day Concussion Protocol exists to establish a conservative standard of care in the NFL and to ensure that competitive considerations do not influence player healthcare. The Protocol provides medical staffs responsible for the care of NFL players with a standardized process for identifying and managing potential concussions. **Your health and your rights are best protected by reporting all injuries.**

2017 Protocol updates:

- **The addition of** an Unaffiliated Neurotrauma Consultant (UNC) located at NFL headquarters in New York to monitor the broadcast feed of all games and to identify signs or symptoms of concussion.
- **Enhanced use of technology**, including additional communication channels and electronic tablets to record the results of each step of the Protocol and to guide the physicians through the application of the sideline examination.
- **Requirements** that the Booth independent certified athletic trainer (called the ATC Spotter) receive confirmation from the UNC/Team Physician that a sideline examination has occurred following concerns raised about a specific player. If confirmation is not received before the player returns to participation, the Booth ATC Spotter will be required to call a Medical Timeout.
- **Mandatory in-person training** regarding the updated Protocol for UNCs, Booth ATC Spotters and members of Club Medical Staffs responsible for the diagnosis and treatment of concussion.
- **The use of medical examination tents** on every NFL sideline to provide a private environment in which the medical personnel may conduct their examinations.
- **The addition of** a third UNC for all playoff games and the Super Bowl.
- **Mandatory mid-season education** for all team physicians, UNCs, and Booth ATCs regarding impact seizures, posturing or the fencing response, and gross motor instability and the required care pathways under the Protocol

Summary of Game Day Concussion Protocol

A **"No-Go" Signs and Symptoms.**
"No-Go" Signs and Symptoms. If a player exhibits or reports any of the following signs or symptoms of concussion, he must be removed immediately from the field of play, transported to the locker room, and may not return to participation (practice or play) on the same day under any circumstances:

1. Loss of Consciousness (LOC) (In addition to obvious LOC can be manifest from 2 specific findings, each of which indicates clear LOC and game removal)
   - Impact Seizure
   - Posturing or Fencing Response
2. Confusion
3. Amnesia

In addition, Gross Motor Instability *(requires mandatory locker room examination)

B **NFL Sideline Concussion Assessment (Sideline Survey)**
If a player exhibits or reports a sign or symptom of concussion or a concern is raised by the club's athletic trainer, team physicians, Booth ATC Spotter, coach, **teammate**, game official or UNC (collectively referred to as "gameday medical personnel") the player must be immediately removed to the sideline and must undergo the entire NFL Sideline Concussion Assessment which consists of the following:

1. A review of the "No-Go" criteria reviewed above (Loss of Consciousness, Confusion, and Amnesia);
2. Inquiry regarding the history of the event;
3. Review of concussion signs and symptoms;
4. Maddock's questions;
5. Video Review of the injury; and
6. Focused Neurological Exam, inclusive of the following:
   - ✓ Cervical Spine Examination (including range of motion and pain);
   - ✓ Evaluation of speech;
   - ✓ Observations of gait; and
   - ✓ Eye Movements and Pupillary Exam.

The Sideline Concussion Assessment shall be (i) conducted inside the medical evaluation tent on the sideline and (ii) performed using the tablet or other technology assigned by the NFL. If *any* elements of the sideline assessment are positive, inconclusive, or suspicious for the presence of a concussion, the player must be escorted to the locker room immediately for the complete NFL Locker Room Comprehensive Concussion Assessment.

If, upon completing the Sideline Survey, the medical staff concludes that the player did not sustain a concussion, then the player may return to play.

Violation of Concussion Protocol

The Protocol also sets forth disciplinary action against a club should a member of its medical staff or other employee fail to follow the Concussion Protocol. Under the policy, the NFL and NFLPA will follow a strict process to investigate incidents and determine appropriate discipline, including club fines and possible forfeiture of draft picks.

Potential disciplinary action includes:

1. A first violation will require the club employees or medical team members involved to attend remedial education, and/or result in a maximum fine of $150,000 against the club.
2. Second and subsequent violations of the concussion protocol will result in a minimum fine of $100,000 against the club.
3. In the event the parties agree that a violation involved aggravating circumstances, the club shall be subject, in the first instance, to a fine no less than $50,000.
4. In the event a club's medical team fails to follow the protocol due to competitive considerations, the club may be required to forfeit draft pick(s) and impose additional fines exceeding those amounts set forth above.

2017 NFL Concussion/Return to Play Checklist

Player receives impact to the head **AND** Player exhibits or reports symptoms of signs suggestive of a concussion or stinger **OR** ATC, booth ATC, team physician, NFL official, coah, teammate or UNC initiates protocol

↓

Player is immediately removed to sideline or stabilized on field, as needed.

↓

Sideline Survey

Remove helmet. Team Physician and UNC perform sideline survey:

- ○ No-Go
- ○ History of Event
- ○ Concussion Sign/Symptoms
- ○ Maddock's Questions
- ○ Video Review
- ○ Focused Neurological Exam:
  - ○ Cervical Spine Exam (including range or motion-pain)
  - ○ Evaluation of Speech
  - ○ Observation of Gait
  - ○ Eye Movements and Pupillary Exam

← If normal sideline survey and "benign" video, player may **RETURN TO PLAY**.

No-Go

- ○ LOC
- ○ Confusion
- ○ Amnesia

If observed at any point,

NO RETURN TO PLAY.

↓

If ***any*** elements are positive, inconclusive or suspicious of concussion, player is escorted to locker room.

↓

Locker Room Exam

Team Physican/UNC/ATC **OR** Team Physican/UNC perform locker room exam:

- ○ Complete NFL SCAT
- ○ Complete Neurological Exam

← If normal assessment, player may **RETURN TO PLAY.**

↓

If abnormal, NO RETURN TO PLAY:

- ○ Player stays in locker room
- ○ Periodic evaluation by medical team
- ○ Follow-up neurological exam

During the above checklist, if player demonstrates progressive/worsening concussion symptoms = **NO RETURN TO PLAY**.

ADDITIONAL PATIENT RESOURCES

The NFLPA and the American Academy of Neurology published an education video about the Protocols and brain health

The Complete Concussion Diagnosis and Management Protocol

NEUROLOGY

Headaches

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SUMMARY POINTS

Headaches can be divided into two categories: **1) primary headaches and 2) secondary headaches**

Migraine headaches are the **most common type of primary headaches**

Medications for the treatment of migraine headache are divided into **two categories: 1) rescue medications** (stop headaches once they start) **and 2) preventive medications** (prevent headaches from occurring)

If you have migraines, experience recurrent head or neck pain, or suffer a significant hit or series of hits, **you should seek advice from your athletic trainer or a neurologist**

Why is this Important?

Headaches are among the most common ailments that cause people to seek medical attention. While strenuous exercise and physical exertion are potential triggers for headaches, studies have also shown that regular exercise helps to reduce headache frequency, duration, and severity. Given the demands that athletes put on their bodies and their physiology, it is important they understand this common medical condition, its potential triggers, and treatments.

Headaches can be divided into two categories: primary headaches and secondary headaches.

Primary headaches occur independently, which means they do not occur as a side effect of another medical condition. Secondary headaches are those that do occur because of other medical conditions, such as the common cold, sinus infection, dehydration, sleep deprivation, or concussion.

Migraine Headaches

Migraine headaches, which are the most common type of primary headaches, can be further subdivided into migraine with aura and migraine without aura. The differentiation is important because migraines with aura may be associated with an increased risk of other neurologic issues.

A migraine aura is a temporary neurologic symptom that occurs before the onset of head pain. It typically lasts approximately 20 minutes and can be considered as a warning that a headache is about to begin. Symptoms of a migraine aura can vary, with the most common (>90%) being visual auras. Visual auras can include zigzag lines with flashing edges, shimmering speckles, and slow-growing bright or dark spots. Other migraine auras may include sensations such as numbness (sometimes referred to as "pins and needles") that may start from a small point on the body and spread over minutes to involve larger areas of the tongue, face, or entire body.

Migraine headaches can also be accompanied by other symptoms, including dizziness or vertigo, which is the sensation of spinning or whirling when you are not actually moving. Although people having a migraine can have difficulty speaking, this symptom is rare. Some people experience a prodrome, which is an early symptom (or set of symptoms) that might occur hours or days before a remainder of the migraine attack begins. Symptoms of a prodrome may include fatigue, decreased concentration, neck stiffness, increased sensitivity to light or sound, nausea, blurred vision, increased yawning, and paleness of the skin.

The pain that occurs with a migraine headache may involve just one side of the head or the whole head. Moreover, the location of the pain commonly changes around the head and is most commonly described as pulsating or pounding, like a "heartbeat" inside the head. Migraines are frequently associated with changes in appetite and may cause nausea or vomiting, which if prolonged, can lead to dehydration.

Box 1. Migraine headache triggers

Certain foods, such as chocolate, red wine, processed meats (hot dogs, sausage, pepperoni), or monosodium glutamate (MSG)
Poor sleep
Intense smells
Loud noises
Bright lights (such as those found in most stadiums)
Watching television or using computer screens
Being at a high altitude
Sudden changes in physical exertion level
Rapid changes in the weather

Many daily life occurrences can trigger migraine headaches. See Box 1 for a partial list of triggers. A headache diary can be used to track food intake, sleep patterns, and activities to help identify specific migraine triggers.

Treatment of Migraine Headaches

Proper treatment of migraine headaches is essential to making life less painful and improving athletic performance. If you suffer from migraines, see your primary care doctor or seek treatment from a headache specialist, such as a neurologist. Treatment strategies can include lifestyle modifications (sticking to a regular sleep schedule, modifying diet, etc.), medications, or simple in-office procedures. Different game plans work for different people.

Medications for the treatment of migraine headache are divided into two categories—those that stop headaches once they start (called rescue medications) and those that prevent headaches from occurring in the first place (preventive medications) intended to reduce the frequency of attacks.

Rescue Medications

The common over-the-counter rescue medications include most anti-inflammatory medications, such as ibuprofen (Motrin, Advil), naproxen (Aleve, Naprosyn), and aspirin. Combination preparations also seem to have an added benefit. Excedrin Extra Strength and Excedrin Migraine, which combine acetaminophen, aspirin, and caffeine, often work well for mild migraines. Over-the-counter medications should be used cautiously; daily use for more than 2 weeks can lead to medication-overuse headaches, as the medications become less effective and the pain more difficult to control.

A specific class of prescription rescue medications called triptans is designed to stop migraine headaches. These formulas are more effective than those available over the counter. However, they are potent constrictors of blood vessels and must be used sparingly and under the supervision of a physician.

Acetaminophen (Tylenol) is a type of pain reliever that does not reduce inflammation; therefore, typically, it has minimal effect on migraines.

The FDA has approved three classes of preventive medications (Box 2) for use in migraine headaches: anti-depressant medications, blood-pressure medications, and anti-seizure medications. Taking these medications does not mean that you have the primary conditions they were originally designed to treat. It is quite common that medications designed to treat one condition are found to be beneficial for another.

These preventive medications can work extremely well, dramatically improving the quality of life of patients who suffer from migraines. They are typically started at low doses and the dose is then increased slowly. Most migraines respond to low doses, but some require higher doses or combinations of medications for better control.

In identifying the best medication for each person, other problems must be considered. For example, the listed anti-depressant medications are also known to promote sleep, while both the anti-depressant and anti-seizure medications can sometimes lead to fatigue and mental fogginess. Importantly for athletes, all blood-pressure medications can diminish athletic performance. For these reasons, it is best to work with a headache specialist to determine which treatments are best for you.

Box 2. Medications approved by the FDA for use in migraines.

Anti-depressant medications	Amitriptyline, Nortriptyline, Protriptyline
Blood-pressure medications	Propranolol, Metoprolol, Verapamil
Anti-seizure medications	Topiramate, Valproic acid or Sodium valproate, Carbamazepine, Zonisamide

Other Types of Primary Headaches

In addition to migraines, there are several other types of primary headaches.

Tension headaches represent the most common type of primary headaches and are generally associated with tenderness of the head or neck. These headaches usually involve both sides of the head, and the sufferer mainly feels a pressure sensation over the head or as if your head has been placed in a vice. These headaches can be brief or can be continuous, lasting for days to months. Although not associated with nausea or vomiting, tension headaches can be associated with sensitivity to light or sound, but rarely to both. Exertion rarely worsens tension headaches. Most can be managed with over-the-counter medications, but some require prescription medications for management. Migraine-preventive medications have been used successfully with frequent tension headaches.

Cluster headaches are less common overall, but more common in men than they are in women, and they are more common in athletic males. Presenting as attacks of severe, one-sided pain around the eyes and forehead, they come in clusters of multiple short-duration headaches that last 15 to 180 minutes and occur with a frequency that ranges from every-other day to 8 times per day. Redness of the eye, tearing, nasal congestion, runny nose, forehead and facial sweating, dilated pupil, and drooping eyelid—all on the side of the head where the headaches occur—and restlessness or agitation are all common symptoms. Whereas migraines rarely awaken you from sleep, cluster headaches can.

Cluster headaches may respond to migraine-preventive therapies, and cluster attacks are known to respond well to the use of 100% oxygen. Other medications from the anti-seizure class, typically given intravenously, may be helpful, as well as anti-inflammatory steroid medications.

Headaches called **paroxysmal hemicranial headaches** are similar to cluster headaches. A paroxysmal hemicranial headache can present in the same way as a cluster headache, in that it can present as a severe, debilitating, unilateral headache, usually affecting the area around the eye. These headaches normally consist of multiple severe but short headache attacks that affect only one side of the head, with one major difference—they typically respond exclusively and completely to the anti-inflammatory prescription medication Indomethacin.

Irritation of superficial nerves on the scalp can also trigger headaches. The most common such occurrence seen in athletes is irritation of the nerves on the head (extracranial nerves), most notably, the greater occipital nerve (located on the back of the head at the point at which it meets the neck) or the supraorbital nerve (located just above the eyebrows).

Recurrent, shooting pain up the back of the head or around the ears is referred to as **occipital neuralgia**. Inflammation of the occipital nerves may be induced by trauma. The pain is commonly described as an intense pressure or squeezing pain in the back of the head, around both eyes, and in the forehead. The pain seems to worsen as the day progresses; it also worsens with exposure to light and sound. Nausea rarely accompanies these headaches, and vomiting almost never occurs. Appetite can be decreased and fatigue is increased. Most patients who experience occipital neuralgia never really feel rested. Balance can be affected, and motion sickness can be present, even if motion sickness was never experienced before. Visually busy places such as grocery stores or department stores can induce dizziness and unsteadiness. Neck pain and stiffness frequently accompany this condition. Ice applied to the back of the head and anti-inflammatory medications control most of these headaches. Recovery is hastened by limited movements of the head or prolonged flexion (the position that occurs when bending at the neck to look down).

Headaches that are not easily managed or are worsening or inhibiting performance are best treated by a headache specialist who can help the athlete maximize performance.

Secondary headaches

Secondary headaches are those that occur as a side effect of other medical conditions such as common cold, sinus infection, dehydration, sleep deprivation, concussion, or brain tumor.

Whenever you have a headache of any sort, it is a good idea to think about what could be causing the headache. The following 3 conditions would be of particular concern and should be evaluated by a medical professional:

- **Infections** such as a sinus infection or the flu can certainly cause a significant headache. If you have a fever, cough, nasal discharge, or all-over body aches in addition to a headache, you should let your physician know as soon as possible.
- **Neck strain** is an extremely common cause of headache in football players. It may be from a hit or series of hits or from strength training.
- **Concussion**, another common cause of secondary headache, is covered in the **chapter** on concussion. However, in general, anytime you have a headache after a significant hit or series of hits, you should tell your athletic trainer or physician as soon as possible. Proper and timely evaluation is critical to getting the right diagnosis. Remember, not every headache that you experience in the course of playing football is caused by a concussion.

In addition to the information provided here, it is important to note that headaches may also be an early symptom of a more serious condition. If you have migraines, experience recurrent head or neck pain, suffer a significant hit or series of hits, you should seek advice from your athletic trainer or a neurologist.

It is important to note that headaches may also be an early symptom of a more serious condition.

ADDITIONAL PATIENT RESOURCES

WebMD

MedlinePlus

National Headache Foundation

Mayo Clinic

PubMed Health

EXOS APPENDIX

EXOS APPENDIX

Introduction to Nutrition

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EXOS believes nutrition should be simple. In fact, it may be easier to think in terms of fueling rather than nutrition. After all, we're fueling our bodies for high performance. We fuel to perform, fuel to recover, and fuel to win — whether in sports or life.

At EXOS, we want to simplify nutrition and help you perform your best in every situation. We all want to have the energy to stay mentally focused and physically strong throughout the day. We want to boost our immune systems and speed up the recovery process. Performance nutrition plays a critical role in achieving these goals.

Each time you eat and drink is an opportunity to stabilize your energy, boost your immunity, rejuvenate your body, and accomplish the goals you set in life. If you don't provide your body with the nutrients it needs from food, beverages, and smart supplementation, those nutrients won't magically appear. Without performance nutrition, you create a nutrient deficit, and while you might not feel it right away, it will catch up with you.

This appendix will help you look at your life, your day, and your meals and ask yourself, "Am I making the best choices?"

EXOS Nutrition Principles

The EXOS nutrition principles were designed as a guide to fuel you for success in every situation.

1. **Make it about you**
2. **Fuel for impact**
3. **Aim to sustain**
4. **Eat with purpose**
5. **Devour life**

1. Make It About You

Eating is personal. It's not about following a strict set of rules; it's about tailoring your nutritional game plan to best support your body, goals, and preferences. Food is an experience you design. Adapt these principles to make them work best for you and all that you want to achieve.

Three keys to success:

1. **Know yourself.** Understand your goals, habits, and unique physiology to refine your nutritional game plan.
2. **Design deliciously.** You're the top chef when it comes to building meals with the right foods in the right amounts for you.
3. **Fuel your dreams.** Choose foods that support your personal goals and preferences.

2. Fuel for Impact

Our understanding of quality food is constantly evolving with research. When deciding what to eat, keep it simple and natural or minimally processed. Choose responsibly sourced food that's tasty and nourishing such as vegetables, fruit, nuts, whole grains, fish, and lean meat.

Four keys to success:

1. **Feed your superpowers.** Fill your plate with foods that help your body fuel, build, protect, and prevent.
2. **Up your color quotient.** Create power meals with a variety of nutrient-dense vegetables and fruit.
3. **Fill the gaps.** It can be tough to get all your nutrients from food alone. If you fall short, supplement wisely.
4. **Maximize your efforts.** Eat and drink the right things before, during, and after your workout.

3. Aim to Sustain

Staying hydrated and eating early and as often as you need helps sustain energy, lower stress, and boost metabolism. No matter your schedule, kick-start your day with an energizing meal. Continue eating small meals or snacks and hydrating throughout the day to keep your energy up, your focus sharp, and your mood stable.

Three keys to success:

1. **Rise and dine.** Eat your first meal within 30 minutes of waking up.
2. **Create an even spread.** Spread your meals and snacks evenly throughout the day.
3. **Stay hydrated.** Choose beverages that hydrate your brain and your body.

4. Eat with Purpose

What you eat matters. Eating with purpose is about coming to the table and nourishing your mind, body, and spirit. Food is a means to connect and create, and to enable the best version of you. Be intentional with your food choices, and savor every morsel and moment you share with others.

Three keys to success:

1. **Set your intention.** Hit pause and think about what you're consuming with your goals in mind.
2. **Find balance.** Aim to eat well around 80 percent of the time.
3. **Eat together often.** Find some time to enjoy food with friends and family.

5. Devour Life

Food brings us together and takes us on personal journeys. From the smell of something delicious baking in the oven to the satisfying crunch of crisp vegetables, food reminds us to reflect, look forward, and relish the here and now. A toast — to food and all the joy it brings.

Three keys to success:

1. **Try new things.** Go on food adventures. Explore, experiment, and discover.
2. **Raise a glass.** There's always a reason to celebrate. Find yours.
3. **Savor good times.** Let food remind you of special occasions, people, or places.

Make It About You | Design Deliciously

You're the top chef when it comes to building meals with the right foods in the right amounts for you. To understand how much you should be eating, take your body size, activity level, and goals into account. Work with a dietitian or other performance professional to personalize your nutritional game plan to best support your goals and preferences. If you have trouble with portion control, remember that it takes your brain more time than your stomach to realize you're no longer hungry. So, limit distractions and take your time to enjoy food.

Food Portions 101 *(all foods are single servings)*

Breads

1 slice	100% whole-wheat, rye, white, pumpernickel or sourdough bread
1/2	English muffin
1/2	Bagel (3")
1	Roll (small)
6"	Pita bread
6"	Corn or flour tortilla

Fruits

1	Medium whole fruit (e.g. apple, orange, banana)
1/2 c	Applesauce, unsweetened
3/4 c	Blueberries
1 1/4 c	Strawberries, whole
1 c	Raspberries or boysenberries
1 c	Cantaloupe or honeydew, cubed
1 1/4 c	Watermelon, cubed
1/2 c	Canned fruit (canned in juice)
12-15	Grapes
12	Cherries
3	Dried prunes or plums
2 tbsp.	Raisins or other dried fruit
4-6 oz.	100% fruit juice

Vegetables

1c	Raw vegetables
1/2c	Cooked vegetables
6 oz.	Most vegetable juices

Cereals and Grains

1	Most cold cereals
1/2 c	Puffed cereals (e.g. puffed rice)
1/2 c	Cooked cereal (e.g. oatmeal, oat bran, Cream of Wheat)
1/2 c	Cooked brown or white rice
1/2 c	Cooked enriched or whole-wheat pasta

Meat and Protein

3-4 oz.	Meat
1/2 c	Beans
2 tbsp.	Peanut Butter
2	Eggs
1/2 c	Cottage Cheese

Milk and Dairy

8 oz.	Milk or chocolate milk
8 oz.	greek yogurt, plain or with fruit

Quick tips

An ounce of nuts should fit into the small of your hand

A medium-sized piece of fruit is the size of a tennis ball.

An ounce of cheese is about the size of four stacked dice.

A cup of mashed potatoes is the size of your fist (depending on your size).

Three to 4 ounces of meat is about the size and thickness of a deck of playing cards.

A ½ cup of cottage cheese is the size of a tennis ball.

A teaspoon of margarine or butter is about the size of your thumb.

Refer to the **Meal Builder in EXOS Journey** to create a personalized meal plan.

Fuel for Impact | Feed Your Superpowers

Fuel for Impact | Feed Your Superpowers



Great Starches

1 serving = the size of your fist

- Fuels your brain and muscles.
- The best starches are brown and are found close to the ground.
- Opt for foods with fewer ingredients and at least 3 grams of fiber per serving.

Examples include:

- Oatmeal
- Brown rice
- Starchy vegetables (potatoes, squash, peas)
- Quinoa
- 100% whole-wheat bread

Power Proteins

1 serving = the palm of your hand

- Builds muscle and maintains the immune system.
- Choose lean proteins with less visible fat, or a good rule of thumb is “the less legs, the better.”
- Try to include a lean protein source with every meal or snack.

Examples include:

- Fish (salmon, tuna, cod)
- Chicken or turkey breast
- Lean red meat
- Dairy
- Eggs

Fantastic Fats

1 serving = the tip of your thumb

- Protects your brain, provides energy, regulates blood sugar, improves cholesterol, and keeps you feeling full.
- Omega-3 fatty acids improve cognition, decrease inflammation, and enhance heart health.
- Try to get one serving of healthy fat per meal (two total servings of fatty fish per week).
- If you aren’t getting enough in your diet, look for an omega-3 supplement to provide at least 1,000 milligrams of EPA and DHA per day.

Examples include:

- Seeds
- Oils (fish, flax, olive)
- Flaxseed
- Avocados
- Pecans, walnuts, almonds

Fuel for Impact | Up Your Color Quotient

Vegetables and Fruits

- They're a great source of high-nutrient, high-fiber carbohydrates that can't be replicated in a supplement.
- Whole vegetables and fruits are best.
- Strive to eat at least three servings of vegetables and two servings of fruit over the course of your day.

Restorative Nutrition by Color

- **Yellow foods** optimize brain function.
- **Green foods** rejuvenate musculature and bone.
- **Orange foods** support skin and mucosal tissues.
- **White foods** enhance the immune system, lymph system, and cellular recovery.
- **Red foods** support the heart and circulatory system.
- **Purple foods** promote microcirculation.

Fuel for Impact | Maximize your Efforts

Pre-Workout

- Start your activity with enough fuel to give your maximum effort.
- Top off your fuel tank with fluid and a small, balanced snack containing a carbohydrate and a small amount of protein about one to two hours before activity.
- Going into a workout properly fueled will improve performance and jump-start recovery.
- Make sure to hydrate with 16 to 20 ounces of water.

Pre-Workout

- Stay hydrated during exercise to maintain performance and cognition.
- Proper carbohydrate, fluid, and electrolyte levels during and between activities, including games, helps replenish hydration and fuel levels to maintain optimal performance.

Hydration

- Losing just 2 percent of your body weight during exercise can cause fatigue and impair performance.
- Weigh yourself before and after activity. Drink 20 ounces of fluid for every pound of weight you lose during activity.
- Keep weight loss to less than 2 percent during your workout (e.g., a 200-pound person should lose no more than 4 pounds of body weight).
- Take four to six gulps of fluid about every 15 minutes.

Drinking Sports Drinks

- Grab a sports drink if you're training for over an hour, training in extreme environments, you haven't had any fuel, you have a short but extremely intense workout, or you're looking to gain lean body mass.
- Choose lower calorie electrolyte replacement beverages if you're training for less than an hour or at a low intensity or if you're aiming to lose weight.

Post-Workout

Whether you exercise in the morning, afternoon, or evening, make sure your performance nutrition strategy matches your goals. The right blend of nutrients will help you get the most out of your training, boost your energy levels to keep you sharp, and support your body's recovery process. Eating the right ratio of carbohydrates and protein after workouts repairs muscle, speeds up recovery, and re-energizes the brain and body. And don't forget to replace lost fluids and electrolytes. The sooner you get your post-workout nutrition, the quicker you'll recover

Within 10 Minutes of Training

1. **Refuel with carbs.** The more intense the training, the more carbohydrates you need.
2. **Rebuild with protein.** Body weight determines protein needs post-workout.
3. **Rehydrate with fluid.** Drink 20 to 24 ounces of fluid for each pound lost during training.

What you Need to Recover

Body Weight (lbs)	Protein (g)	Carbs (g)
120-150	15-20	30-40
151-180	20-25	40-50
181-215	25-30	50-60
216-250	30-35	60-70
251-300	35-40	70-80
301-330	40-45	80-90

Recovery Nutrition Options

The goal is to match your recovery nutrition to your needs, but here are a few good options for post-workout snacks to get you started.

- **Recovery shake made with 100 percent whey protein isolate**
- **Greek yogurt with fruit or honey**
- **20 ounces of chocolate milk**
- **1 cup of oatmeal with milk and almonds**
- **1/2 of a peanut butter and jelly sandwich on whole-grain bread**
- **1 sourdough English muffin, 2 hard-boiled eggs, 1/4 of an avocado, and sliced tomato**
- **1 cup of Greek yogurt, whole-grain cereal, and berries**
- **Whey or vegan protein blended with frozen fruit or Greek yogurt**
- **Scrambled eggs with whole-wheat toast and 6 ounces of juice**

Fuel for Impact | Fill the Gaps

It can be tough to get all your nutrients from food alone. If you fall short, supplement wisely.

Just keep in mind that there's no one-size-fits-all answer. What you eat, drink, and supplement with should be based on your needs and goals. In addition, your habits, blood work, and personal preferences can help dietitians or other qualified performance professionals create a more customized nutritional game plan for you.

Reasons to Supplement

Here are a few good reasons to consider including supplements in your nutritional game plan:

- A known nutrition deficiency
- Medical diagnosis
- Increased stress
- Digestive issues
- Inability to incorporate a variety of vegetables, fruit, lean protein, high-fiber carbohydrates, and healthy fats consistently into your daily meals.

Where to Begin

Let's look at your goals, your lifestyle, and the nutrients you're getting from what you eat and drink. Is there an opportunity to upgrade your eating or hydration habits? How about your lifestyle? Let's start there. Do you know your current nutrient status? The old saying of "you are what you eat" has been upgraded to "you are what you absorb." Keep in mind that your body's nutritional needs fluctuate with changes in diet, work schedule, stress, sleep, illness, and physical activity.

Nutrients Matter

When there are dietary deficiencies or specific times when supplements will help you achieve your goals, choose supplements intentionally and carefully. And once you begin a supplement routine, stay consistent. If you don't provide your body with the nutrients it needs, you'll create a nutrient deficit that will catch up with you over time and negatively affect your performance.

Bottom Line

Every person is unique. Consider your needs and goals carefully before taking supplements. Think about fueling your body first and complementing your diet with supplements to fill gaps, elevate performance, or support recovery.

Aim to Sustain | Rise and Dine

Research shows that people who eat breakfast tend to be healthier, leaner, and make better choices throughout the day. A great breakfast includes protein, color, a high-fiber carbohydrate, and fat. To build a great breakfast, make sure all areas are represented.

Protein

- Eggs or egg whites
- Ham or turkey
- Beans
- Yogurt
- Milk
- Quinoa

Color

- Fruit in your cereal, oatmeal, or yogurt
- Vegetables in your eggs or omelet
- Vegetables and fruit in your shakes and smoothies

High-Fiber Carbohydrate

- Whole-wheat bread
- High-fiber cereal, oatmeal, or beans

Fats

- Avocados
- Olive oil
- Nut butters
- Nuts and seeds
- Chia and hemp seeds
- Egg yolks

What to Look for in Supplements

The supplement industry is under-regulated. Even well-informed consumers can be misled. Here's what to look for when choosing nutrition products.

Testing
Make sure your supplement is third-party tested by a company such as NSF International, Informed-Choice, or United States Pharmacopeia.

Efficacy
Learn about the company's reputation for producing results. Only buy from a company that has an established record of conducting business ethically.

Quality
Look for a company committed to purity. Avoid artificial sweeteners, artificial colors, and unnecessary additives. See if the company produces its products in an NSF International good manufacturing practices-registered facility. NSF verifies that the facility has the proper methods, equipment, and controls in place for meeting quality standards.

Quick tip: After breakfast, spread your meals and snacks throughout the day. Although there are many philosophies on how often you should eat, eating well all day helps you stay focused and energized so you can perform your best. For healthy snack ideas, visit Core Performance.

Aim to Sustain | Stay Hydrated

Dehydration = Decreased Performance

- Water is essential to your body because it helps:
  - Increase productivity
  - Reduce stress
  - Regulate appetite
  - Improve concentration
  - Regulate temperature
- Dehydration of 2 percent of your bodyweight can lead to a 20 percent decrease in performance, decreasing lateral movement, speed, and mental acuity.
- Limit intake of alcohol, soda, energy drinks, sweetened teas, and fruit drinks. These drinks rob your body of water and provide little nutritional value.
- Water should be your main source of hydration. Add lemon, cucumber, or mint, or occasionally reach for unsweetened green tea.
- Choose a sports drink before, during, and after intense exercise that lasts more than an hour.
- Keep a water bottle on your desk and reach for it all day.

How to Maintain Hydration

Drink ½ - 1 ounce of fluid per pound of body weight per day.

Example: Body weight (180 pounds) / 2 = 90 pounds = 90 ounces of fluid per day (minimum). A liter bottle is about 33 ounces. A 180-pound individual will need to drink at least 3 liters of fluid throughout the day.

Refer to the **Guided Path on Hydration** in EXOS Journey for more information.

Eat with Purpose | Set your Intention

Travel Nutrition Straegies

When traveling, the most important step to staying on track with your performance plan is to take control of your food choices. Follow these simple suggestions, and you'll be on your way to improved nutrition and increased energy.

Airport Food Tips

1. Look for a sandwich shop and bring something on the plane. Keep your snacks and water accessible.
2. Choose a plain garden salad, and add your own packet of tuna or salmon. Ask for red wine vinegar or olive oil. You can also add pre-portioned nuts for healthy fat.
3. Use airport kiosks to your advantage. Many places serve plain garden salads, Greek yogurt, whole fruit, plain oatmeal, and plain sliced vegetables.
4. Many kiosks and airport restaurants also offer hard-boiled eggs, grilled chicken, sandwiches on whole-wheat bread, and pita wraps.

Nutrition note: Keep a journal to write down any food or fluid you're consuming that isn't part of your meal plan.

Breakfast choices: eggs, oatmeal, whole-grain cereal, yogurt, whole-wheat toast, and peanut butter

Lunch and dinner choices: lean meat, whole-grain bread, whole-wheat pasta, and brown rice

Snacks: high-quality bars, shakes, sandwiches, fruit, nuts, beef jerky

Your Travel Checklist

Don't Travel Without It

- Bars with high-quality ingredients and at least 5 grams of protein and 3 grams of fiber
- Sandwiches (pita, tortillas, bread)
- Rolled, steel-cut, or instant oatmeal

Lean Proteins

- A shaker bottle with 1 to 1 ½ scoops whey or vegan protein already in it. All you need to do is add water.
- When it comes to meat protein, the less legs the better.
- Packets of albacore tuna in water
- Packets of salmon
- Other options you can prepare in advance include hard-boiled eggs, baked chicken, turkey, and tuna
- Beef or turkey jerky

Healthy Fats

- Pre-portioned almonds (11 almonds)
- Pre-portioned walnuts (7 halves)
- Natural peanut butter
- Cheese sticks

Colorful Fruits and Vegetables

- Whole apples, oranges, bananas, and/or pears
- Red, yellow, or orange bell pepper slices
- Cucumber slices
- Baby carrots
- Grape tomatoes
- Leafy greens

Other Nutrition Tips for Traveling

1. **Don't skip meals.** Eat every three hours.
2. **Bring bars and shakes**. These are great snacks and pre- and post-workout fuel.
3. **Make sure there is a lean protein choice with each meal.** Grilled chicken, filet of beef, grilled fish, or grilled pork are all great choices. Other options include turkey, ham, and roast beef sandwiches. Avoid anything fried.
4. **Complete your meal.** Include grains, wholesome carbohydrates, vegetables, and fruit at every meal.
5. **Stay hydrated.** Drink ½ to 1 ounce of water per pound of bodyweight per day. This is especially important for air travel. Aim to drink about 8 ounces of fluid every hour on the plane.

Tips for Eating and Cooking on the Road

- Purchase a high-quality, insulated lunch box.
- Pack a cooler with ice from the hotel.
- If a cooler is unavailable, fill the hotel sink with ice for a makeshift cooler.
- Use a coffee pot to boil water for oatmeal or soup.
- If possible, request a hotel room with a microwave and mini refrigerator.

Snacks for a Cooler in the Car

- Cheese sticks
- Hard-boiled eggs
- Yogurt tubes
- Cow, soy, or almond milk
- Sliced fresh vegetables
- Pre-portioned hummus or guacamole containers
- Whole fruit (e.g., apples, oranges, bananas)

Nonperishable Foods for the Road

- High-quality, whole-grain cereal with at least 5 grams of fiber per serving
- Pre-portioned snack bags of nuts, dried fruit, seeds, or trail mix
- Pre-portioned nut butter containers
- Beef or turkey jerky
- Vacuum-packed packages of tuna, salmon, and chicken
- Peanut butter and jelly or honey sandwiches
- Bagels
- Whey or vegan protein powder
- Sweet potato or beet chips

Eat with Purpsoe | Find Balance

Aim to eat well about 80 percent of the time.

If you're making thoughtful food choices most of the time, allow yourself some meals or days to indulge in foods that may not be the best for your health but satisfy other needs, such as enjoying a treat or celebrating with friends. After all, food is about more than nutrients. A balanced perspective to eating will help you stay aware of what you put in your body, and it will also make you more likely to eat well over the long haul.

Refer to the **Guided Path on Mindful Eating** in EXOS Journey for more strategies.

EXOS APPENDIX

Performance

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Introduction to Performance

Performance is about results. It's not just showing up, working hard, and doing the right things. That's expected. It's about becoming more efficient in every aspect of your life to raise the bar every day.

High performers are always creating a new normal that's better than where they were a year ago, or even last week. And it's not just about what's accomplished in the gym. What about the other 23 hours of your day? What about the little opportunities, some perhaps only a few minutes or even just seconds that can help you improve your performance?

High performers know time is precious and are willing to invest small amounts in a precise, disciplined way to minimize their injury risk or loss of resources. When it comes to training, they know what happens in the gym or on the practice field is a small part of the equation. Performance can be upgraded in so many other ways over the course of your day. Best of all, when those actions are integrated into your routine, they become non-conscious habits.

Ninety percent of your actions are driven by habits, whether positive or negative. You're the sum of your behaviors, which means who you are today — physically, emotionally, mentally, professionally, and financially — reflects your behaviors and the choices you've made to this point. Falling short in any of these areas is a deficiency in performance. But if you're willing to do the work, you can upgrade your current system and define a new normal. Think of training as the process of what it takes to bring your A-game all day, every day, to hit your goals, whatever they may be. Excelling in sports is one thing but thriving in all aspects of your life is an entirely different game. When you approach every day like it's game day, you win. When you're able to establish an integrated, efficient 24-hour system for performance, not only will you be more productive, but you'll also have a positive impact on the people around you.

The goal is to effectively train yourself across EXOS' four pillars: Mindset, Nutrition, Movement, and Recovery.

1. **Mindset**
   Mindset is how you view, create, and embrace life's circumstances to accomplish your performance goals. Your ability to manage and motivate yourself in social and nonsocial environments will drive the level of support you need to cultivate a sustainable path to success and high performance.

2. **Nutrition**
   Foundational nutrition refers to nutrients required to fuel the brain and body. Your intentions, behaviors, barriers, and desires will determine the fueling plan necessary to sustain you through your high-performance needs.

3. **Movement**
   Both incidental and structured movement is essential for mental and physical health, performance, and vitality. Effective and efficient movement with a balance of mobility, stability, power, and conditioning will help you achieve proper positions through clean movement patterns with appropriate levels of power, reducing injury risk and improving performance.

4. **Recovery**
   Recovery is the process by which one returns to a state of balance after incurring negative mental or physical stress loads. Regeneration is any activity that proactively or reactively helps facilitate recovery, re-energizing and renewing the brain and body for optimal performance.

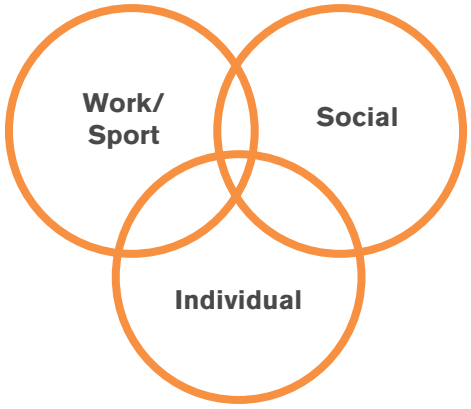
It's the seamless integration across these four pillars that build the backbone of a high-performance lifestyle. The pillars aren't independent of each other but rather interdependent. This enables unique solutions that help you meet your needs and goals. In any context, the four pillars work simultaneously, all pulling in a unified direction to help you achieve more. For example, your mindset directly affects the way you approach movement, which is also affected by how you fuel and your ability to recover. Each pillar has a profound influence on each of the other pillars.

Mindset

Through your conscious and non-conscious processes, you create and maintain a vision of yourself, which, for better or for worse, dictates corresponding realities. If you continue to see yourself in a negative light, it can result in negative performances consistent with that belief. On the other hand, a more positive view of yourself can translate into better performance. Being able to manage your mindset in various situations is one of the most important aspects of performance.

There are three distinct contexts you must successfully navigate to consistently perform at a high level (Figure 1). Each of these contexts (work/sport, social, and individual) represents a dynamic ecosystem you must both proactively and reactively maneuver. This requires you to understand yourself and your tendencies in addition to how you relate to and handle other people. Your self-efficacy, self-awareness, self-image, self-management, and self-motivation will influence and be influenced by these contexts. In addition, your ability to manage expectations, plan for success, and manage your successes and failures is imperative to your continued success. To reach peak levels and grow, you must develop a high-performance mindset.

Figure 1



Achieving a high-performance mindset requires you to be coachable, positive, and have the grit to stay focused and motivated. In doing so, you're able to understand your unique individual goals and clearly identify what EXOS calls your "it," the thing that drives you most. Consider the role model you want to be for your family and friends. What needs to improve for you to be that person for yourself and for them? You should constantly be looking for ways to be smarter and more efficient in everything you do. Without a proper mindset, success is impossible.

Additionally, without integrating Nutrition, Movement, and Recovery into your Mindset, you miss the opportunity to become a high performer. For example, without the best foods, your brain won't have the energy or nutrients it needs to operate properly. Without recovery, it can't think outside the box. Without increasingly challenging your movement, the critical circuits in your brain won't be activated to promote new thinking. Finally, without adapting this mindset, your old thoughts won't let go to allow for new ones.

Creating an "it" statement is the first step to developing a winning mindset, helping you find purpose in everything you do. You'll turn to this "it" statement several times a day to remind you of why you're choosing to upgrade your performance. It will drive your decisions and habits across these four pillars.

The "it" illuminator process is designed to align your motivations with your behavior, and it should reflect what's most important to you. Taking 15 minutes to go through the exercise defines what is important and builds your confidence to live in alignment with your "it." This exercise creates a context to view your daily decisions so that your actions reflect what you're trying to achieve. Your "it" statement could revolve around family, career, or health. It doesn't matter, as long as you dig deep enough to get at the core of what's most important.

Please see the performance toolkit at the end of this **chapter** for instructions on how to complete the "it" illuminator.

Nutrition

Food is fuel for your body and brain. It can help you perform your best in every situation. Proper fueling and hydration strategies give you the energy to stay mentally focused and physically strong throughout your day while boosting your immune system and speeding up the recovery process. High performers constantly plan to ensure they'll have the proper fuel available to achieve their "it."

The simple fact is, the way you fuel your body can make or break your performance. The longer you consume foods that don't provide the proper fuel and nutrients, the more you cause inflammation and create an energy deficit. In fact, you could be operating at such a deficit, relying on sugar and caffeine just to get through the day, that you've lost the energetic feeling that only comes from proper nutrients. Those nutrients don't magically appear; they must come from food.

Fueling isn't about how many calories you consume. Food is information and what you eat will have short- and long-term effects on every aspect of health and performance. In other words, you can consume a lot of food, but still be lacking efficient fuel. Look at your life, your day, and your meals and ask yourself, "Am I making inspired choices with my fuel and hydration?" If not, you can always go back to your "it" illuminator to help clarify your intent and your decisions.

Use the EXOS nutrition principles as a guide to fuel for success in every situation.

Make it About You
Eating is personal. It's not about following a strict set of rules; it's about tailoring your nutritional game plan to best support your body, goals, and preferences. Food is an experience to be designed by you. Adapt these principles to make them work best for you and all that you want to achieve.

Aim to Sustain
Staying hydrated and eating early and as often as you need helps sustain energy, lower stress, and boost metabolism. No matter your schedule, kick-start your day with an energizing meal. Continue eating small meals or snacks and hydrating throughout the day to keep your energy up, your focus sharp, and your mood stable.

Fuel for Impact
Our understanding of quality food is constantly evolving with research. When deciding what to eat, keep it simple and natural or minimally processed. Choose responsibly sourced food that's tasty and nourishing like vegetables, fruits, nuts, whole grains, fish, and lean meat.

Eat with Purpose
What you eat matters. Eating with purpose is about coming to the table and nourishing your mind, body, and spirit. Food is a means to connect and create, and to enable the best version of you. Be intentional with your food choices, and savor every morsel and moment you share with others.

Devour Life
Food brings us together and takes us on personal journeys. From the smell of something delicious baking in the oven to the satisfying crunch of crisp vegetables, food reminds us to reflect, look forward, and relish the here and now. A toast — to food and all the joy it brings.

You want to habitually consume foods that nourish your body to give you the fuel you need to meet the challenges of daily life and perform at a world-class level. Thus, food is fuel. When you have energy, you naturally perform and feel better. When you're able to understand which foods positively affect your body and energy level, you'll naturally gravitate toward them. You'll stop eating and start fueling. Remember, you're fueling to support your vision.

Refer to the Nutrition **chapter** in this playbook for more detailed information and recommendations on meals, serving sizes, and more.

Movement

The power and efficiency of movement patterns are the prerequisites to high performance. By working to counteract the effects of a sedentary society that typically have you hunched over computers, phones, and steering wheels much of your day, you can create a powerful physique that serves as a vehicle for professional and personal success. Like the chassis of a high-performance vehicle, you must maintain and service your movement so it can provide a foundation for your technical skills, whether you're training for a sport or for life.

Perhaps you've been a high performer to this point, but you've paid a price to get here. Past injuries and current pain don't have to define you or your lifestyle. By implementing quality movement, whether during training or simple daily activities, you can begin to undo inhibitory patterns and empower your body's return to optimal functioning order. It takes a performance mindset — one that includes grit, positivity, focus, and motivation. Not only will an adequate mindset positively influence movement, but movement will also positively influence the health and function of your brain. Better movement helps improve memory, reduce stress, and enhance mood. With the proper tools and guidelines, you can maintain the quality of life you desire and deserve.

High performers move efficiently through all three planes of motion (frontal, sagittal, and transverse), no matter their professional requirements. Their bodies exhibit the mobility, stability, and power that nature intended. Movement efficiency, strength, total-body power, speed, and fitness are all necessary to ensure you can handle your professional and recreational activities with ease and low risk of injury. From an athlete's perspective, these qualities are key to acceleration, absolute speed, agility, and overall endurance. You can be trained in any number of ways, but there are only a few proven methods that help you move efficiently and perform at a high level while enhancing recovery and reducing your injury risk.

Each training component of the EXOS system is a collection of movements designed with a specific intent. They're purposefully and sequentially organized to optimize performance and minimize risk of injury while helping your body do more. The EXOS system focuses on improving mobility, stability, and movement patterns while increasing strength, power, and endurance. The goal is to "clean up" the movements needed to perform your tasks better.

The EXOS training components are **Pillar Preparation**, **Movement Preparation**, **Plyometrics**, **Movement Skills**, S**trength and Power**, **Energy Systems Development**, and **Regeneration**. Below is an explanation of each in detail.

Pillar Prep

The body isn't a collection of parts but rather an integrated system from which all movements are based. It all starts with your pillar — the torso, hips, and shoulders. This is the hub to your wheel, the center of all movement, as energy is both generated from it and transferred through it. If your pillar lacks stability or mobility, energy leaks occur and cause inefficient movement, which leads to decreased performance and a greater risk of injury.

Pillar Prep is a brief series of movements that activate and strengthen your pillar, providing great stability before progressing to more challenging movements. Pillar Prep tunes up your mind and muscles to incorporate Pillar Strength into every movement of your workout, since every exercise or movement pattern requires it. Additionally, mastering your breathing patterns during Pillar Prep and for the duration of your workout will ensure that your torso is supported, you're well on your way to moving efficiently, and you're preventing long-term deterioration.

Refer to the **EXOS Journey Workout Library** for Pillar Prep routines.

Movement Prep

The traditional approach to warming up consists of static stretching (stretch and hold) and a general warm-up such as riding a stationary bike. However, an active series of warm-up exercises that increase core temperature is more beneficial. We call this Movement Prep. It activates your nervous system and lengthens, strengthens, stabilizes, and balances your muscles. As the name suggests, it prepares you for upcoming movements. Movement Prep will re-establish your mobility, coordination, and joint stability, and improve your strength and balance so your body can enjoy the years ahead.

The goal is to improve the long-term mobility and flexibility of your muscles. Rather than have them stretch and revert to where they were (as is the case with static stretch-and-hold routines) you want your body to remember these new ranges of motion. This is done through a process of lengthening the muscle (known as active elongation), that's more effective

than traditional stretching. Instead of passively lengthening your muscles, you actively lengthen and immediately strengthen them by contracting through this new range of motion. Instead of simply stretching, you're showing your muscles how to use the motion.

As you master the movement patterns, pay attention to your posture and pillar strength. Also, be aware of any asymmetries between your right and left sides as well as your front and back. Movement Prep is a powerful self-evaluation tool and can be a daily indicator of where your body is. It will help you focus on the areas you need to address.

Refer to the **EXOS Journey Workout Library** for Movement Prep routines.

Plyometrics

Plyometrics can improve your body's elasticity, which is its ability to generate and reduce force. Elasticity decreases the potential for injury and allows you to produce more force (or less, if needed) in less time. Plyometrics are the perfect blend of stability, mobility, strength, power, and dynamic balance exercises for all levels. They promote control of the body through dynamic movements, and they're designed to link strength and speed.

As dynamic exercises require you to move up and down, side to side, and twist back and forth, they activate your body's central nervous system, stimulating fast-twitch muscle fibers so you can generate force as quickly and efficiently as needed. Movements include jumps, hops, and bounds in various planes of movement and of various speeds and loads.

Plyos enhance power, but they're also one of the greatest protectors an active person can have. Elasticity helps you withstand rapid loads and the lengthening of muscle tissue that happens on every stride and play of your sport. The body's ability to feel the rate of stretch, store the energy, and return it to the starting point is a protective mechanism that helps prevent injury on and off the field. Elasticity gives you a set of involuntary brakes and deceleration mechanisms to withstand high and rapid stretch loads so that the body doesn't disassemble. Your joints provide the structure of your body, but it's the elastic properties of your muscular fascial system that keep everything connected. Therefore, they must be trained.

Movement Skills

Movement patterns are skills you learned as an infant. First, you learned how to crawl, then kneel, then stand, then walk, then run. Everyone, whether an athlete on the field or a father at the park with his child, has a specific set of movement skills that must be mastered to move as efficiently as possible with the least amount of energy wasted. Movement Skills develop your overall control of your body, which is essential for injury prevention and sustaining overall quality of life.

EXOS focuses on linear and multidirectional skills to enhance overall speed, agility, endurance, and power. But just because the primary focus of movement skills is speed and athleticism doesn't mean they won't help you if you don't play any sports at all. For lifestyle training programs (to build strength or lose weight, for example), you'll still improve the way you move by working on these drills, ultimately reducing your injury risk and helping you get more out of your training.

Movement Skills represent your ability to apply the highest speed at the right time with the right angle of force into the ground or another object. Some might consider Movement Skills speed training, and indeed that's part of it. But they aren't called "Movement Skills" for nothing. There is skill required to move efficiently with speed and power whenever it's needed. Whatever movements your life requires, you'll benefit from learning how to apply force with greater efficiency and reduced potential for injury.

Strength and Power

The goals of strength training are to improve a variety of capabilities such as maximal strength, strength endurance, and reactive speed, as well as improve joint integrity and minimize the risk of injury.

EXOS training prepares you to perform for your sport, your profession, or your lifestyle. It's a specific mix of progressive, integrated multi-joint, multi-planar, proprioceptively-enriched movements at various loads and speeds tailored to the individual. Training the upper and lower body at varying loads and speeds with proper rest periods will help your body adapt

to stress by decreasing body fat, increasing caloric expenditure, and improving overall performance. These movements can be executed across a variety of equipment and training tools, including weights, kettlebells, and medicine balls. This balanced approach to strength training across various loads and stimuli enables optimal strength and power for activity-specific movement skills.

Refer to the **EXOS Journey Workout Library** for strength routines.

Energy Systems Development

Unfortunately, the word "cardio" has become associated with long, slow training that's inefficient. The idea of slow, steady-state training for weight loss is a losing battle. Instead, alternating periods of work and rest across various levels of intensity is the most effective approach to improving cardiovascular endurance, VO2 max (your maximal aerobic capacity), and power. The lower the ratio of work to rest, the bigger the challenge, which increases your capacity to do work, burn more calories, and feel more vital. Cardio should be viewed as a means of creating more power and a way to improve your ability to maintain high intensities of effort for longer periods of time. This process is what EXOS calls Energy Systems Development or ESD.

ESD trains your body's energy systems and develops endurance so you can move efficiently at high speeds for short bursts of time. Each burst is followed by active recovery and additional bursts of movement, which allows you to perform at higher intensities repeatedly without becoming fatigued. You'll be as fresh and as fast at the end of your training session as you were at the beginning, giving you a competitive advantage.

The benefits of ESD also extend beyond the training floor. Improving your endurance can give you the energy to make it through a long day at work, keep up with your children, and enjoy more recreational activities. Losing weight and burning fat are byproducts of improving your body's ability to generate and use energy.

Refer to the **EXOS Journey Workout Library** for ESD routines.

Regeneration

Regeneration involves planned activities and nutrition strategies to help your body physically and psychologically minimize pain and soreness, overcoming the stress of training and the stress of life. It's essential to stay on your game.

Consider the demands of everyday life, plus intense training. The cumulative stress to your muscle tissue and nervous system require a recovery plan integrated into your overall daily and yearly training plans. This should include sleep cycle strategies, pre- and post-workout nutrition, as well as dedicated recovery days, weeks, and cycles. Otherwise, you risk overtraining, burnout, and injury. Remember, it's not just about what you do during training. What you do the other 23 hours and the rest of your week matters, too. In other words, Regeneration could be the difference between reaching and not reaching your goals.

If you don't give your body and brain time to recover, they're never going to improve. Regeneration strategies will maximize your results from training while reducing your injury potential and recharging your mind. If you can't get an entire activity in, take five minutes in the morning, after your workout, and before bed to implement Regeneration strategies into your routine. The more rapidly you recover, the quicker your body adapts and the more your performance improves.

Refer to the **EXOS Journey Workout Library** for recovery routines.

The performance toolkit at the end of this **chapter** also contains a list of Regeneration strategies.

Recovery

No matter how well you follow a training program, your success will be compromised if you don't adequately recover. It's a 24/7 process involving proper regeneration of your muscles and bones, the various branches of your nervous system, your metabolism, and your psychological health. After all, it's impossible to go all-out, all the time.

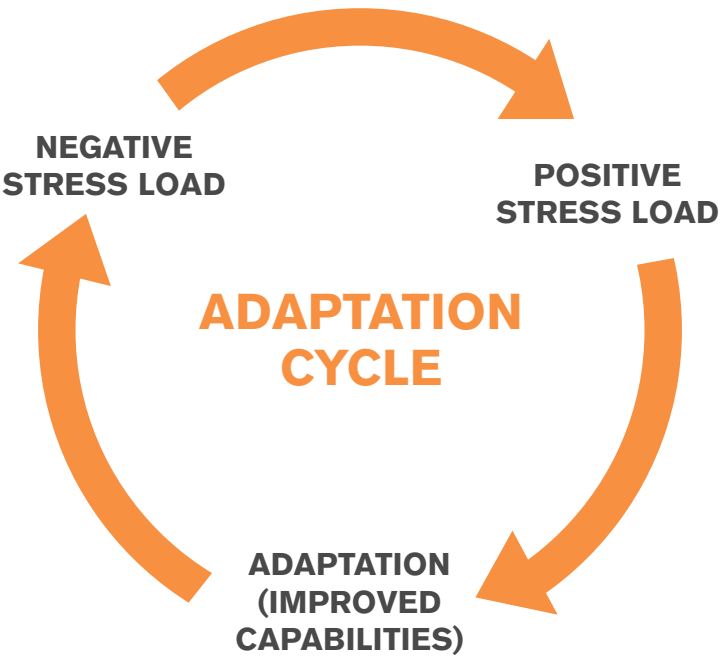
To recovery properly, Regeneration strategies should be employed throughout your day, week, month, and year. Yet, they're often ignored in the current fast-paced culture where people assume the answer is working out longer and harder without rest. In reality, fueling success is about working more efficiently and prioritizing recovery. Training and daily stress break down your tissue and your mindset, but gains are made from the growth and healing factors associated with recovery. It's how your mind and body repair, recharge, and upgrade.

This isn't just about taking a day off from training once or twice a week or getting an occasional massage, both of which are effective strategies. Instead, recovery refers to several Regeneration methods you can use over the course of your day to fuel success.

Look at recovery time as the equivalent of recharging your batteries or refueling your tank. If you run out of fuel and don't take time to replenish, your machine (your brain and body) will fail, causing detriment to performance, increased injury risk, and negative cognitive and psychological effects.

The adaptation cycle (Figure 2) best describes this loop, where negative stress load is any activity that depletes your current state and positive stress load is any activity that replenishes your current state. The ability to take advantage of the adaptation window, shrinking the time to achieve full recovery, dictates how close you are to being the best at what you do. This is done by improving your capabilities across all four pillars and recovering properly. Being aware of this cycle will make you more attuned to the signals of mental and physical stress and the subsequent need for Regeneration strategies. Not only will you know when but you'll know what type of Regeneration you need, helping you combat the impact of past stress and prevent the onset of future stress.

Figure 2



The things you do to promote recovery are just as important as the work you perform. Regeneration strategies will increase your energy, boost your immune system, and help you get the most out of each day and each training session, which ultimately improves your performance. A solid recovery plan will improve your hormone profile, decrease inflammation, and improve tissue quality, which will decrease the number of overuse injuries you may experience.

Regeneration strategies apply to every aspect of your life. It all starts with the confidence to know that reloading your gun isn't a waste of time but a necessity if you want to continue to fire rounds of excellence. You can use the following principles to optimize your performance through recovery.

- **Build resilience.**
  Improve your knowledge and skill level across the pillars to help create a buffer against the stress of life and maintain a sustainable recovery plan.

- **Prioritize Regeneration.**
  Protect your schedule and dedicate time to Regeneration on a regular basis to maintain a balanced rhythm of negative and positive input.

- **Stay a step ahead.**
  Identify the types of stress you experience and proactively implement the appropriate Regeneration methods to mitigate the load and minimize the impact they have on you.

- **Rebound from the impact.**
  Pay attention to how you're feeling. Use Regeneration methods to rebound from the negative effects of stress and help you return to balance as quickly as possible.

As you begin to adopt these principles, you may find that you crave recovery and it will naturally become a part of your routine. At that point, you'll surpass most of the currently over stimulated world in understanding just how critical Regeneration strategies are to improving performance.

Refer to the performance toolkit at the end of this **chapter** for a list of Regeneration strategies.

Performance Summary

Performance isn't about being perfect. The goal is to make the best decisions possible in every given situation. If you improve your environment in terms of Mindset, Nutrition, Movement, and Recovery, you'll be in a better position to make effective decisions. You're a unique individual with unique goals and desires. Understand that optimizing your health is a lifelong journey and not an overnight destination. It takes many years to become a champion — give yourself the opportunity to attack one simple strategy at a time and work up to executing more. And remember that you are a function of your behaviors, which are driven by choices. If you can be 80 percent successful in your choices 100 percent of the time, that's effective.

High performance is a result of the deliberate integration of all four pillars, beginning with Mindset and ensuring proper attention is placed on Nutrition, Movement, and Recovery. Becoming a high performer in all aspects of your life requires commitment to a path that sustains peak mental and physical health. Every day you rise out of bed, aim to deliver your best, hit the bull's-eye, and raise the bar again and again.

Refer to the performance toolkit at the end of this **chapter** for a guide to create your own performance day game plan.

Performance Toolkit

"It" Illuminator

You're the expert in everything "you." You know the most about how you've succeeded and what hasn't worked out. Tapping into that expertise, the following process will help inspire the choices you make in life to help you develop purpose in everything you do.

1. **Step 1**
   From the words below, write down 10 that jump out at you as the most meaningful to your life right now in the square box. Feel free to add a word if you don't see it.

2. **Step 2**
   Now, from those 10 words, circle the three that are the most meaningful and valuable to you. These words should reflect what's important to you in your life.

3. **Step 3**
   Using those three words, create a statement that tells a story about living your life in the best way possible. Write that statement in the top rectangular box.

Physical Performance	Pain	Appearance
Endurance	Relief	Lean
Fitness	Pain-Free	Choice
Strength	Freedom	Comfort
Power	Activity	Confidence
Speed	Movement	Attractiveness
Resilience	Function	Youthfulness
Personal Best	Prevention	Tone

Health	Relationships	Energy
Vitality	Family	Energy
Longevity	Commitment	Empowerment
Health	Responsibility	Restful
Quality of Life	Giving	Focus
Feel Alive	Connection	Alertness
Aging	Support	Vitality
Spirituality	Presence	Enthusiasm

Emotional Wellbeing	Work Performance	Challenge (New Things)
Optimism	Focus	Evolve
Balance	Efficiency	Try
Presence	Productivity	Open
Motivation	Communication	Exciting
Calmness	Creativity	Accomplish
Happiness	Success	Challenge
Contentment	Organization	Goal

4

Step 4

On the grid below, there are four boxes. Thinking about the statement you created in Step 3:

- **In the top left box,** write down all the disadvantages to *not* living in alignment with your description of your best life.
- **In the top right box**, write down all the advantages of *not* living in alignment with your description of your best life.
- **In the bottom left box**, write down all the disadvantages of living in alignment with your description of your best life.
- **In bottom right box**, write down all the advantages of living in alignment with your description of your best life.




Look at the upper left and bottom right boxes. If you don't live your life in alignment with the description you wrote using your three words, the contrast between the life you want and the one you currently have could be large. With a few simple changes moving forward, you can ensure that the bottom right becomes your actual life in the future.

Look at the upper right and bottom left boxes. These boxes represent your barriers to living your ideal life: bad habits in the upper right box and automatic, non-conscious excuses and perceptions in the bottom left box.

5

Step 5

Think about each of the steps you've gone through in this exercise. Using six words or less, create a slogan to inspire and guide you through the choices you make as you create your ideal life.

Does this statement describe your motivation in life right now? If not, go back and try again. These statements can be fluid and changed whenever you feel like it.

Regeneration Strategies

Below is a list of recommended strategies designed to restore and recharge the brain and body. Carve out time in your schedule to implement these before and after incurring mental and physical stress. These simple strategies can be attached to daily activities like drinking a glass of water before brushing your teeth, stretching while in the shower, foam rolling while watching TV, or listening to light music before bed.

Methods

- Soft-tissue mobilization
- Contrast hot/cold
- Lymphatic drainage massage
- Infrared sauna, light therapy
- Cryotherapy
- Hydrotherapy
- Compression
- Electrical stimulation
- Aromatherapy
- Acupressure/puncture
- Dry needling
- Floating

Activites

- Stretching/yoga
- Active isolated stretching
- Tai chi/qi gong
- Aerobic flushing (e.g., light walk/bike ride)
- Art, music, or hobby
- Journaling/writing
- Spiritual practice
- Socialization
- Vacation

Mindfulness Techniques

- Breathing tempos
- Meditation/visualization
- Nature immersion
- Earthing
- Sleep/rest

Nutritional Techniques

- Foundational nutrition
- Performance fuel
- Therapeutic nutrition

Performance Programming Recommendations

Here are the recommendations for each EXOS training component. Implement these into your training program to improve your movement efficiency, strength, power, speed, and overall fitness.

PILLAR PREP PROGRAMMING

Component	Movements	Volume (Set/Rep)
Soft Tissue	2-4 muscles	1 set / follow protocol based on methos (foam roll, trigger point, etc.)
Mobility	2-4 movements	1 set / 5-10 reps each (2 sec hold)
Stability	2-4 corrective movements (based on FMS priority)	1 set / 5-10 reps each

MOVEMENT PREP PROGRAMMING

Component	Movements	Volume (Set/Rep)
Hip Activation	2-4 movements	1-2 sets / 10-15 reps each
Dynamic Stretching	4-8 movements	1-2 sets / 4-6 reps each
Movement Integration	4-6 movements	1-2 sets / 10-15 YDS
Neural Activation	4-6 movements	1-2 sets / 5-15 sec

PLYOMETRIC PROGRAMMING

Frequency	Volume	Intensity	Movements
Weekly: 2x (15-20 min) **Focus:** Speed-Strength	**Contacts:** 40-60 / session **Total:** ≤120 / week	**Sets/Reps:** 2-3 sets / 4-6 reps **Rest Set / Session:** 1-3 min / 72 hours	**Movements:** 3-5 **Directions:** 1-2 **Initiations:** 2-3
Weekly: 4x (5-15 min) **Focus:** Activation	**Contacts:** 20-30 / session **Total:** ≤120 / week	**Sets/Reps:** 1-2 sets / 4-6 reps **Rest Set / Session:** 1-2 min / 24 hours	**Movements:** 2-3 **Directions:** 1-2 **Initiations:** 2-3

MOVEMENT PROGRAMMING

Frequency	Volume	Intensity	Movements
Weekly: 2-4x (10-15 min) **Focus:** Technical	**Sets/Reps:** 2-6 sets / 4-6 reps or 10-15 YDS **Rest Between Sets:** 1-3 min	**High Intensity (>95%):** Full CNS demand **Low Intensity (<75%):** Pattern Rehearsal	**Movements:** 2-6
Weekly: 2-4x (10-15 min) **Focus:** Skill Application	**Sets/Reps:** 4-8 (+/- 2) / Dist. dependent upon movement focus **Rest Between Sets:** Full (5-8 min)	**High Intensity (>95%):** Full CNS demand	**Movement:** 1-3

STRENGTH/POWER PROGRAMMING

Targeting Intensity - Primary/Secondary Lifts					
	SETS	REPS	INTENSITY	REST	UNI/BILATERAL
Foundational	2-4	6-12	≤65%	N/A	unilateral
Nonfunctional Hypertrophy	3-6	9-12	70-80%	<1min	unilateral bilateral
Functional Hypertrophy	4-8	6-8	79-85%	1-2 min	bilateral
Strength	6-12	≤5	85%+	3-5 min	bilateral
Power	6-12	≤5	45-65%	3-5 min	bilateral

ESD PROGRAMMING

	Yellow		Green			Red
	INTERVAL	CONTINUOUS	INTERVAL	MET-CON	FITNESS	PERFORMANCE
W:R	2:1-1:1		4:1-1:3	N/A	2:1-1:4	1:5-1:6
Sprint Length	30 sec effort to 5 min rest	N/A	15 sec effort to 4 min rest	N/A	10 sec effort to 30 sec rest	<15 sec
Session Time	20 min+		10-20 min			5-12 min

REGEN PROGRAMMING

Sample Training Day ReGen Options	Sample Regen Day
Post-Workout Fueling	**Active Rest (20-30 min)**
Self-Massage (5-10 min)	**Self-Massage (15-20 min)**
Static or Dynamic Stretching (5-10 min)	**Static or Dynamic Stretching (15-20 min)**
Hydrotherapy (10-12 min)	**Hydrotherapy (10-15 min)**

Performance Game Day Plan

MY PERFORMANCE DAY

	PREPARE	FUEL	MOVE	RECOVER
MORNING	○ Visualize day ○ Set daily goals ○ Repeat IT and visualize benefits of living it	○ Breakfast ○ Hydrate ○ Multi-vitamin + fish oil	○ Pillar Prep + Movement Prep	○ Targeted breathing
LATE MORNING	○ Repeat IT and visualize benefits of living it	○ Snack ○ Hydration check	○ Posture check ○ Intentional movement break	○ Trigger point
AFETRNOON	○ Mindfulness check ○ Repeat IT and visualize benefits of living it	○ Lunch ○ Hydration check ○ Snack	○ Posture check ○ Intentional movement break	○ Micro vacation
EVENING	○ Intentional transition from work to rest ○ Repeat IT and visualize benefits of living it	○ Dinner ○ Hydration check	○ Soft tissue massage ○ AIS stretching	○ Targeted breathing
LATE EVENING	○ Complete gratitude journal entry	○ Snack ○ Hydration check	○ Get off feet and elevate above heart	○ Sleep ritual

MY IT

MY FOCUS AREA

MY DAILY GOALS

Set SMARTER Goals

Use this SMARTER formula as a simple tool to help define and refine your goals. Here's what it stands for:

1. **Specific**
   Set clear singular goals for each outcome. Too many goals and conditions may create confusion and give too much opportunity to derail from your focused intention. Ask yourself: What is my intended outcome, and what do I need to do to achieve it?

2. **Meaningful**
   Set goals that matter to you and motivate you. Will they inspire you to excel and become a better person? Do they have personal meaning to you and/or your family?

3. **Achievable**
   Set goals that are realistic. Consider your ability to achieve them given the constraints of your schedule or the context of your personal circumstances. Are your goals realistic given your limitations? Will you have the time and energy to execute against those limitations?

4. **Relevant**
   Set goals that are personal and connected to your current circumstances. Do they fit within the context of your life, relationships, daily schedule, and expectations?

5. **Time-bound**
   Set goals with time limits that alert the brain and body to immediate action. When do you want this completed by? Is it realistic?

6. **Evaluative**
   Constantly assess the ongoing value of your goals. Are they still meaningful? Are you still engaged for the right reasons? Are they still relevant? Are you achieving what you set out to do?

7. **Revisable**
   If you find that you need to adjust your goals in any way, pivot early and grow from what you've learned along the way. Take time to reflect and notice what worked and what didn't so you can move forward with more knowledge and competence.

Planning achievable and meaningful goals is essential to success. Recent research shows that setting SMARTER goals promotes successful, long-term changes in behavior. Additionally, setting one long-term goal with a series of short-term goals enables you to achieve small wins along the way and reap early benefits of success and confidence.

Use the "it" illuminator in the **Performance chapter** of this playbook to understand the meaning behind the goals you set.

Commit to Now

Forget what you "used to do" or "can't do anymore" and focus on now. What's the one thing calling you to action right now? Everyone has that one thing that motivates him or her to get out of bed in the morning. Perhaps it's several things, but chances are, even then, they are tied to one driving force that calls you to be an elite performer. So, what's your purpose? Defining that purpose dictates your performance plan. EXOS calls that purpose your "it."

Use the "it" illuminator exercise in the **Performance chapter** of this playbook to identify your "it," which will fuel your desire to improve your life one day at a time, one goal at a time. You'll face tough decisions every day that challenge your non-conscious patterns and habits. Will you make a smoothie or eat biscuits and gravy? Will you wake up five minutes early to stretch? Every moment, you have a choice to make an upgrade in your life. Identifying your "it" will help you stay focused and remember what's truly important and meaningful to you.

People typically start off with their "it" in mind (e.g., losing weight, gaining muscle, getting faster). However, the key isn't to think of your "it" as a goal but rather as a mantra, a statement that summarizes who you are, what drives you, and where you want to be. A successful "it" is driven by the deeper meaning of why it's important to you. EXOS uses a series of questions to help you understand the true purpose behind your goals. Here's how it works: Once you've thought of your purpose, ask yourself, "Why is that important?" Once you have an answer, ask yourself again, "Why is that important?" Continue asking yourself "why" until you land on an answer that feels inspiring, motivating, and emotionally significant to you. This answer will help inform your final "it" statement. That statement, as few as five words, will guide every decision and action over the course of your day.

As you improve the skill and competence needed to coach your own life, you can surpass challenges and achieve your goals. Your connection to a larger vision, how your role makes a difference in the lives of others and in society will increase your determination to stay on course. As you discover your purpose, sit down and share your "it" with your family and friends so they can support you and help you make decisions that contribute to your overall health and performance.

Load up on Veggies and Fruits

Focus on getting leafy greens and nutrient-rich fruits into your meals and snacks. This can improve overall health, recovery, rehabilitation, and performance, getting you get back to your A-game in less time and with more energy. Eat at least two colorful servings of veggies and fruits at breakfast, lunch, and dinner. Work up to nine servings per day. Sneak more color into your diet by adding more veggies and fruits to your smoothies or juices. Experiment with adding a variety of color to your meals with veggies such as green beans, tomatoes, squash, snap peas, carrots, cucumbers, broccoli, collards, kale, spinach, and other leafy greens into soups, casseroles, and salads.

Check out the portion guidelines and source recommendations in the **Nutrition chapter** of this playbook.

Get Your H2O

Water is essential to daily living and required for almost all bodily systems to function properly and efficiently. This keeps your energy levels high, improves and recovers your soft tissue, aids in weight loss, fights off infection, and helps maintain normal blood pressure. Water is also imperative to enhancing and improving brain function, focus, and mood.

A water deficit as little as 2 percent could significantly impair brain function, short-term memory, and attention span as well as coordination and reaction time. Dehydration can also cause headaches and bad moods. On the flipside, research shows that proper hydration improves memory and attention span.

Ensure you're drinking ½ to 1 ounce of fluid per pound of body weight each day. That means a 180-pound person should drink between 90 to 180 ounces of fluid per day. Keep a full water bottle on hand and sip on it throughout the day starting the moment you wake up.

Focus on Healthy Fats

When consumed in appropriate amounts relative to the rest of your diet, healthy fats provide energy, regulate blood sugar, improve cholesterol, keep you feeling full, and play an important role in maximizing brain health. Omega-3 fatty acids — found in nuts, seeds, fatty fish, and EPA/DHA supplements — are critical for brain health and recovery during and even after your NFL career. It's been shown that the brain can heal from injuries even years after they occur. Additionally, consumption of good fats has been linked with improved memory and mood as well as increased protection against brain injury and disease.

Focus on eating more whole food plant fats like chia seeds, walnuts, olives, avocados, and fatty fish like salmon, tuna, or mackerel in appropriate portions. Olive oil or avocado oil are good sources as well. Tone down the fried food, vegetable oil, and animal fat intake, and stock up on anti-inflammatory, protective, energy-producing fats that give your brain and body what it deserves.

Refer to the **Nutrition chapter** of this playbook for sources and portion recommendations.

Move Well, Move Often

Just as healthy snacks fuel the body, so does intermittent movement. This may include full training days or simply adding very basic exercises to your daily routine. Even simple actions such as taking the stairs or parking farther away can enhance brain function by stimulating growth hormones and reversing the ill-effects of sitting too much. An absence of movement for an active person may also have negative effects on mood.

Your body will eventually adapt to poor positions over time (e.g., sitting on a couch, at a desk, or in the car), creating tension in the shoulders, torso, and hips, which will trigger a host of discomfort, aches, pains, and dysfunction. Remember, physical pain exists as a warning signal and can cause anxiety, frustration, anger, guilt, fear, and depression. Bottom line: don't do it if it hurts. There are almost always modifications or alternatives for movements that cause pain.

Place a premium on joint mobility. Add stretches into rest periods at the gym or join a yoga studio with a knowledgeable instructor. If you sit a lot during the day, take five minutes to do some simple Movement Prep first thing in the morning, during breaks, and before all activity. Focusing on the EXOS training components of Pillar Prep, Movement Prep, and Regeneration will enable you to perform daily activities with ease.

Refer to the **Workout Library in EXOS Journey** for movement routines.

Partner Up

Collaboration with like-minded individuals drives a sense of acceptance and accountability. Research shows that partnering with someone you view as more fit than yourself can give you the push you need. It helps you engage and activate your own determination, which will help build competence and confidence that you're in control of your goals. Partnering with someone or joining a group to accomplish your goals can also bring more enjoyment and healthy competition to your routine.

So, partner with a friend, spouse, child, a social cause, a group, or even a digital app to accompany you on your journey. Ensure the goals you create are similar to those of your counterpart. Push each other. Hold each other accountable. Recognize and celebrate each other's successes. This kind of interaction can increase your mood and enhance your personal relationships with family members and friends while increasing your overall quality of life.

Find a Sustainable Pace

You're an athlete. You're a competitor. You go hard. But going hard for too many consecutive days can overwork your body, causing mental and physical breakdown. Aside from Regeneration strategies, one of the most sustainable ways to keep your energy high is to alternate days of high-intensity workouts with low- and moderate-intensity workouts. The body and brain seek balance in everything you do. A balance of upper and lower pushing and pulling, in addition to a strategic training schedule designed to help you meet your SMARTER goals, has been shown to result in the largest performance benefits and reduce injury risk. This will ultimately help you to stay mentally sharp while working toward getting faster and stronger with less pain. Giving yourself an opportunity to recover with lower-intensity bouts of effort will enable you to go hard again the next day.

The most important thing is to listen to your body. If what used to be easy is now hard and painful, give yourself a break and understand that you're upgrading your life one step at a time. Stay positive and remember your "it." Already in great shape? Recognize how far you've come and celebrate wins along the way. If you stay focused, balanced, and maintain your grit, positive change will happen.

Get Quality Sleep

Sleep provides restoration for the body and the brain. Sleep is the foundation of everything we do. It allows you to rebuild your body and replenish your chemical stores while giving you the alertness you need to function throughout your day. Sleep deprivation can interfere with weight loss, memory, energy levels, mental abilities, and mood — all of which you need for a productive training day or workday. But rather than focus on the number of hours, focus on the quality of those hours. Falling asleep faster and staying asleep longer over a period of seven hours is better than getting 10 hours of constantly interrupted rest. Optimizing your sleep environment, practicing sleep rituals, and properly fueling and moving throughout your day can influence how well your brain and body regenerates while you are sleeping.

A healthy and optimal sleep environment is dark, cool, and still. Hanging black-out curtains and using a white noise machine can help. Additionally, dabbing a few drops of lavender or chamomile oil on your pillow and setting your thermostat between 65 and 72 degrees help your brain and body know it's time to rest. Before you even hit the pillow, sleep rituals can help you prepare for a good night's sleep. For example, taking a warm bath or shower, turning off electronics an hour before bedtime, eating some protein to prevent hunger, listening to soft music, meditating, reading a book, or practicing breathing techniques are simple and effective rituals to signal your nervous system that recovery is underway.

Prioritize Regeneration

Stress is an inevitable part of life. While some stress can aid in building resilience and adapting to new levels of performance, a constant influx of disruptive stress will send your nervous system over the edge. This can lead to burnout, injury, emotional

distress, and a host of other mental and physical reactions that will hinder your performance on the field and in life.

In this evolving, over stimulated world, it's essential to protect your schedule and dedicate time to Regeneration strategies on a regular basis. You should maintain a balanced rhythm of negative and positive input. As you learn to identify the symptoms of mental and physical stress (e.g., headache, rapid breathing, rise in body temperature, anger, frustration, anxiety, tension in shoulders or neck), you can begin to combat these imbalances ahead of time with the Regeneration strategies that work best for you. As you move through various phases of training and life, continually reassess the amount and type of recovery your brain and body need to improve performance.

New habits are best formed when you attach them to activities you already do in your daily routine. So, find something you do every day (such as brushing your teeth or fixing a meal) and tack on five minutes of Regeneration before or after that activity using the strategies in the Performance **chapter** of this playbook.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