Regenexx®

EXERCISE 2.0 First Edition

OPTIMIZING FUNCTIONAL PERFORMANCE AND LONGEVITY THROUGHOUT THE LIFESPAN

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Chapter 1

The Foundation

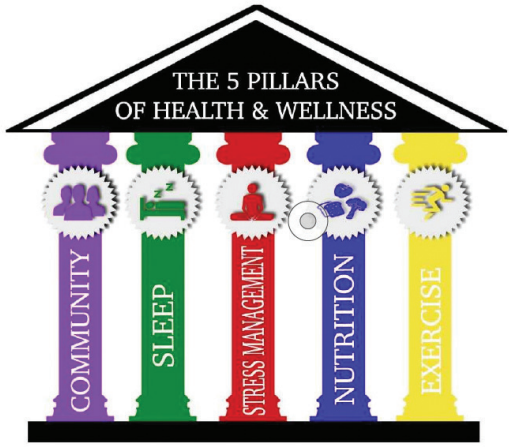
Walking is man's best medicine.
—Hippocrates

Christopher J. Williams, MD

Ron Torrance, DO

Five Pillars of Health and Wellness

If you are reading this book, you have some desire to unlock the secret to living your best life. The five pillars of health and wellness play an integral part in your overall well-being and this book focuses on an extremely important component, Exercise! Although exercise is extremely important, it is also important to remember that a deficiency or imbalance in any of these pillars can lead to the development of acute or chronic injury and disease.



Health Benefits of Exercise

If you had to guess, what do you think would be the most common modifiable risk factor for the prevention of chronic diseases? Smoking? Diet? Nearly 50 percent of adults in North America do not meet the minimum requirements (i.e., at least one hour of exercise per week) for physical activity, making physical inactivity the most prevalent modifiable risk factor for the development of chronic diseases.

Preventable chronic diseases include diabetes, obesity, cardiovascular heart disease, depression, cancer, hypertension, and osteoarthritis.

Physically inactive middle-aged men and women have a 52 percent increase in all-cause mortality, 29 percent increase in cancer-related mortality, and doubled cardiovascular-associated mortality.

The occurence of type-2 diabetes, which is the leading cause of blindness and nontraumatic limb amputation in the developed world, can be effectively reduced by 40–60 percent by incorporating moderate physical activity for a total of 2.5 hours a week.[2] A clinical research trial showed that this simple intervention of moderate exercise was effective at preventing the onset of diabetes and associated mortality when compared to a similar group of people taking the most commonly prescribed medication for diabetes—metformin.

Similar benefits are also seen for exercise and cancer prevention, decreased rates of osteoporosis and fracture reduction, significant reduction of blood pressure in those with hypertension, decreased inflammation and cardiovascular risks, better blood cholesterol, higher metabolism, frailty in the elderly, and improved psychological well-being (through reduced stress, anxiety, and depression).[2]

According to the Centers for Disease Control and Prevention (CDC), all adults should avoid inactivity, with *some* activity better than none. For substantial activity, adults should engage in 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic activity. Aerobic activity should be performed in episodes lasting no less than 10 minutes throughout the week.

The CDC also notes that for additional health benefits, muscle-strengthening activity should be engaged in moderate or high intensity on two or more days a week. The American College of Sports Medicine and the American Heart Association have issued similar recommendations, suggesting moderate aerobic exercise for at least 30 minutes on five days each week or vigorous-intensity aerobic exercise for 20 minutes on three days per week.

Within both of these recommendations, it was suggested progressive weight-training or weight-bearing exercises.

The Beginning

Prior to starting any new exercise program, regimen, or routine, we definitely recommend that you do a minimum of three things:

1. Speak with your trusted healthcare professional to ensure that you are embarking on your new journey of health and well-being in a safe fashion.

2. Read *Orthopedics 2.0.*

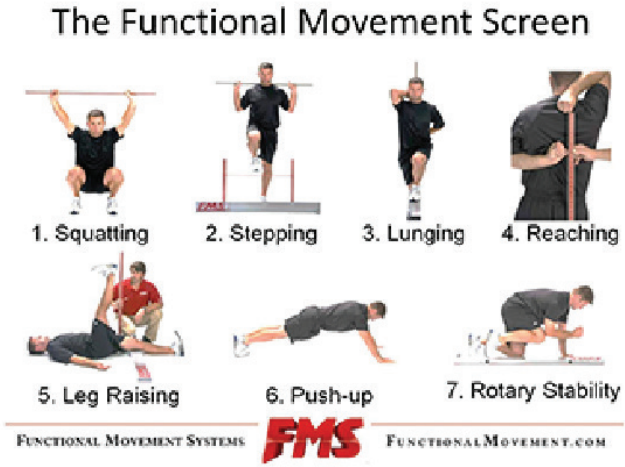
3. Get a Functional Movement Screen.

I cannot stress numbers two and three enough.

Orthopedics 2.0 is an excellent book written by Chris Centeno, MD, one of the pioneers in the paradigm shift of delivering orthopedic care by stressing the SANS approach. SANS breaks down to stability, articulation, neuromuscular, and symmetry. Each of these components plays a critical role in musculoskeletal pain. Traditionally, if you go see your doctor for knee pain, he or she doesn't have time to watch how you walk, check to see if you have overly flat feet or if your ankles are unstable, watch how your knees move when you squat, or assess the nerves in your back. All of these things in combination are the SANS approach and are tightly intertwined to, for example, the knee pain mentioned above. Breaking out of the old mental prison and looking at things comprehensively is *Orthopedics 2.0*.

Movement is an integral part of health, longevity, and, of course, exercise. However, just because you are moving, it does **not** mean that you are moving correctly. The connection between movement patterns and how they relate to injury has been well established. Functional movement as it relates to exercise is simply looking at how your body moves or does not move when doing physical activities. The Functional Movement Screen looks at seven fundamental movement patterns to asses imbalances in mobility and stability, which can inevitably lead to injury when present.

Maladaptive patterns of movement increase the risk of injury and also stifle performance by reducing efficiency. Our primary goal is to get you more active but, more importantly, to increase your activity level safely and efficiently.



The Circle of Fitness

Before we begin to dive deeper, you should take a moment to realize a couple of things:

1. Being “active” is a broad spectrum that ranges from power walking to being a triathlete.
2. Injury can occur at any point during your quest for fitness.

The Circle of Fitness encompasses all the different time points during the process of exercising. We will touch on each of the components in the Circle throughout the book. Below is a brief overview:

- Maintenance and Longevity
    - Day-to-day training to maintain a desired level of activity, performance, and fitness once all active goals have been met
    - Examples:
        - Plyometrics
        - Daily calisthenics
        - Running 3–5 times weekly
        - Strength training 2–5 times weekly
        - Yoga
- Sport and Fitness Training
    - Specific training regimen in preparation for a particular sport or fitness activity (requires a regimented routine to ensure optimal performance when needed)
    - Examples:
        - 12-week running program for marathon training
        - 8-week strength and conditioning program prior to basketball season
        - American Ninja Warrior training
        - Tough Mudder training
- Prehab Training
    - Proactive training to target vulnerable areas to avoid pain and injury, while improving strength, mobility, balance, and flexibility
    - Examples:
        - Yoga
        - Pilates
        - Prior to surgery

- Rehab Training
    - Post-injury training to restore and optimize functional performance for optimal recovery and long-term injury prevention. Practitioners usually employ various modalities and techniques to aid in recovery.
    - Examples:
        - Athletic trainer
        - Personal trainer
        - Physical therapy
        - Occupational therapy
        - Cognitive therapy
        - Egoscue therapy

Chapter 2

Realizing Your Goals

To give anything less than your best is to sacrifice the gift.
—Steve “Pre” Prefontaine

Christopher J. Williams, MD

Ron Torrance, DO

Anatomy and Physiology Basics

The human body is composed of 206 bones and over 640 muscles. The bones are vital for the body to have a defined structure. The various different bones of the body form a series of levers when coupled with the muscles, ligaments, and tendons of the body. The muscles allow the bones to act as a fulcrum to facilitate movement. The tendons attach muscles to bone. The ligaments attach bones to other bones.

When the muscles, ligaments, tendons, and bones of the body coalesce, joints are formed and this allows for the amazing movements that make us inherently human. Whether we are utilizing some of the largest muscles of the body (e.g., gluteus maximus, quadriceps, etc.) to move a heavy load or utilizing the smallest muscles of the body (e.g., lumbricals of the hand) to write with a pen, the body works in synchrony.

The beauty of muscles is that they typically function in pairs in a linear fashion and can contract or relax. When a muscle contracts, a force is put through a lever across a joint that causes movement. When one muscle contracts (e.g., quadriceps), the paired muscle will relax (e.g., hamstrings). Extending the knee causes the quadriceps to contract while the hamstrings relax. This is seen throughout the body.

Utilizing 206 bones and over 640 muscles in different combinations of frequency, intensity, and duration is the foundation of Exercise 2.0.

Aerobic Conditioning Benefits

Everyone remembers biology in high school (OK, maybe not), but at a 14,000-foot view, *aerobic conditioning* is when an athlete is using oxygen to produce energy (ATP) through glycolysis -> Krebs Cycle -> the electron transport system (ETS). On an applicable level, aerobic conditioning happens when you are being physically active with an elevated heart rate that is <180 minus your age. For example, I am thirty-one years old. When I am being physically active and my heart rate remains elevated above baseline but below 149 beats per minute (bpm), I am in aerobic conditioning phase.

Examples of Aerobic Conditioning

- Running a mile
- Biking 10 miles
- Hiking a long trail
- Rowing a 5k
- Pushing a sled with continuous force

Benefits of Aerobic Conditioning

- Increases cardiac output, which increases functional capacity and decreases myocardial oxygen demand
- Lowers blood pressure
- Increases metabolism during the activity
- Weight loss

Anaerobic Conditioning Benefits

Anaerobic conditioning begins once we pass the threshold for aerobic respiration. A rudimentary way of calculating this is to take 180 minus your age and find that number. Once you have that number, anaerobic conditioning begins above that number. Using my previous example, my anaerobic conditioning would begin at 149 bpm. So anaerobic conditioning is the point at which your body does not utilize oxygen for exercise. Good examples of this would be any exercise that is over a short period and is utilizing a near-maximum effort. The previously mentioned exercises in aerobic respiration all can be utilized as an anaerobic activity when maximum effort is applied over a short period of time without utilizing oxygen. This leads to a production of lactic acid via glycolysis.

Examples of Anaerobic Conditioning

- Running a 100m dash
- Biking 0.25 mile as quickly as possible
- Swimming a 50m freestyle
- Lifting heavy weights for a small number of repetitions

Benefits of Anaerobic Conditioning

- Builds lean muscle
- Maintains lean muscle
- Protects joints
- Increases metabolism due to increased lean muscle mass
- Increases strength in bones
- Increases sport performance

Improving Flexibility

Flexibility is the most overlooked portion of exercise and exercise quality. When getting ready to exercise, people are inherently going to have different ranges of flexibility. There is a flexibility and strength axis that coexist, and there is a fine line between each. True power is equal to work over time. Work is the amount of force exerted over a distance. The person with incredible power exerts a force over a large distance in the least amount of time. Multiple different modalities are available for people to increase this all-important variable for power production.

Yoga

There are 14 different described forms of yoga. Yoga is good adjunct to aid with improving flexibility. Depending on the form you choose, it can help in a variety of areas. Here is a brief description of the different forms.

1. **Anusara** is usually described as an offshoot of the purest form of yoga, Iyengar, but asks students to express their poses to the fullest. This form is meant to be heartfelt and accepting.

2. **Ashtanaga** moves through a series of six poses that starts at the beginning and moves through each pose with each breath. When linking the series together with the breath, this is called Vinyasa.

3. **Bikram** moves through the twenty-six basic postures of yoga twice in a room that is heated to 105 degrees with 40 percent humidity, making this class very challenging. Heating the muscles can have the added benefit of increasing flexibility.

4. **Hatha** is the most common form of yoga done in the western hemisphere that is based on posture (asana) and breathing (pranayama) techniques.

5. **Iyengar** is named after its founder. This course utilizes props to get participants into proper positions. Can be beneficial for people with movement restrictions.

6. **Jivamukti** is a practice that takes you to the limit and integrates the spiritual elements of yoga in an educational way.

7. **Kripalu** is a three-part practice of yoga that uses the body as a teacher for oneself.

8. **Kundalini** is a yoga that is very much centered on the chakras of the body. The fluidity of the practice is set to release the serpent energy within each of our bodies.

9. **Prenatal** yoga helps women through pregnancy so they can bounce back to being active quickly after childbirth.

10. **Restorative** involves spending approximately twenty minutes in four or five different poses.
11. **Sivananda** is an unhurried practice that focuses on the same basic twelve asanas that have the same beginnings and ends.
12. **Viniyoga** is a highly individualized yoga that is tailored toward each individual's needs.
13. **Power Vinyasa Flow** is more for aerobic exercise. This type of yoga helps with flexibility and provides blood flow to the muscles, ligaments, and tendons. The multiple different poses all lead back to the home base of downward-dog pose, which is extremely beneficial for posterior chain health.
14. **Yin** involves holding static poses for a long duration. This can help increase the end range of various joints.

Active Isolated Stretching

First described by Aaron Mattes, who developed the method with a doctor of osteopathic medicine. This technique takes different muscles through activation and keeps the muscle at this end range for less than two seconds. This timing is important because this does not allow the stretch reflex to occur. This allows the practitioner to take the joint being mobilized slightly further with every repetition, finding a new end range on repeat testing.

Active Release Technique

Based on the idea of inhibition, this technique was first developed by osteopathic physicians. This technique applies pressure to the muscle fibers, which will relax under continuous pressure.

Improving Stability and Motor Control

Stability and motor control are defined as the ability to resist motion. The basic principles of stability include the following:

- Muscle Firing
    - To be stable, you must activate the correct muscle-firing patterns. If you are firing in an asynchronous pattern, then stability will suffer.
- Stability and Dynamic Stability
    - Dynamic stability involves being able to move through a range of motion-resisting outside factors.
- Strength
    - After having the muscle-firing pattern corrected and dynamic stability gained, then you can gain strength in that muscle through the full range of motion.

Longevity and Maintenance

Motion is lotion! We need to keep our body in motion because a body in motion stays in motion. Each day when we wake up, our bodies need to be stimulated. This stimulation comes in two forms. Eustress or distress. Eustress is a good form of stress, such as exercise that stimulates the body to have a positive reaction. Everyone is familiar with the alternative form of stress—distress. This brings about negative consequences for the body that can bring on deleterious effects, such as exercise fatigue and injury. Balance is key to keeping the body from plateauing and fatiguing, which is key to minimizing the risk of injury.

Chapter 3

Eating for Success

The doctors of the future will no longer treat the human frame with drugs, but rather will cure and prevent disease with nutrition.
—Thomas Edison

Christopher J. Williams, MD

Ron Torrance, DO

The Nutrition Basics

The importance of nutrition cannot be overstated in relation to living a healthy lifestyle and achieving exercise and fitness goals. As the old saying goes, “You are what you eat,” so what you consume is vital to health, longevity, and optimizing your physical performance.

Most “health experts” will tell you that if you want to lose weight, you need to go to the gym. This frame of mind, unfortunately, minimizes the importance of nutrition in the equation. Nutrition is 70–80 percent of not only losing weight but also maintaining a lean physique. Your diet can make achieving and maintaining your goals much easier or become your worst enemy.

At the most simplistic level, the primary goals of nutrition are to do the following:

1. Supply your body with the overall nutrients that it needs to survive
2. Allow you to change your body composition for the purposes of weight loss, weight gain, or maintaining a desired weight

Since I wholeheartedly believe in not re-creating a good wheel, please read *Nutrition 2.0* by John Pitts, MD. In *Nutrition 2.0*, Dr. Pitts provides an easy-to-read blueprint for achieving a healthy lifestyle by breaking down many of the myths, while also highlighting the effects of poor nutrition on chronic inflammation and pain, obesity, and heart disease. He also addresses the effects of nutrition on mental and spiritual well-being. Current trendy topics, such as low-carb and high-protein diets, gluten consumption, and supplements, are also covered. *Nutrition 2.0* is a must read for anyone trying to embark on a healthier lifestyle!

However, there are a few points on nutrition that I feel obligated to briefly discuss.

Protein

Not all protein is created equal! Protein consumed from conventional meat sources has many deleterious health effects, including exposure to many hormones and compounds associated with cancer. If most of us actually knew the conditions that the animals we consumed lived and died in, we probably would be strict vegans. Consuming grass-fed, free-range meat and poultry and fresh and nonfarm-raised seafood as well as incorporating more plant-based protein in the diet is the best recommendation.

Most Americans have a protein fetish and consume well over the daily recommended amount of protein. From the average Joe to athletes, the recommended protein intake in grams per day is roughly 0.9 to 1.1 (closer to 1.1 for athletes and bodybuilders) times one-half (0.5) of your body weight in pounds. So, for the sake of simplicity, your grams of protein consumed daily should roughly be one-half your body weight. It's almost impossible for most Americans to become protein deficient because of our extremely high daily protein intake.

Protein supplements include whey, casein, egg powders, bone broth, and plant-based supplements. Both casein and whey are derived from milk. Casein is more difficult to digest and has been linked to several diseases, including cancer and heart disease. Alternatively, whey is easily absorbed and is a complete protein source. If whey does bother your stomach due to dairy or lactose issues, I would recommend a nondairy plant-based protein. Based on several research studies demonstrating higher estrogen levels and lower sperm counts in men, coupled with the fact that most soy products are genetically modified, I would not recommend soy as the primary plant-based protein source. Some alternatives to soy include hemp, rice, and pea proteins. Bone broth is another choice for protein supplementation. Typically, bone broth is made from the prolonged simmering of chicken (or another animal) tendons, ligaments, and bone and then dehydrated to a concentrate or powder form. Bone broth is gluten free, low or no carb, dairy and soy free, and a complete protein. Like any other animal-meat consumption, the quality of the meat source is key! The bone broth should be derived from a grass-fed, free-range, and/or organic source.

Carbohydrates

Less is more, especially when considering refined carbohydrates. Try and stick with low-glycemic-index (GI) sources of carbohydrates, such as fruit, rolled oats, vegetables, and beans. These foods will also be high in fiber, which is a key component for gastrointestinal health and decreasing the risk of several types of cancer. Foods with a high GI are quickly converted to glucose and lead to spikes in insulin, and any unused sugar is ultimately converted to fat. Avoid foods containing gluten if possible as they can cause inflammation in the gut and lead to increased gut permeability (i.e., leaky gut) and, therefore, the risk of total body inflammation, diarrhea, constipation, autoimmune diseases, and dementia.

Fat

Fat was once treated like the “red-headed step child” of the macronutrients due to flawed research linking saturated fat to heart disease. Fat has many vital functions in the body and is an efficient source of energy. The major points regarding fat follow:

1. Avoid trans fat, which is an artificially produced fat found in processed (e.g., cookies, pastries, pies, etc.) and fast foods (e.g., burgers and fries). Research has linked trans fat with cancer, inflammation, infertility, diabetes, and heart disease.

2. Try and consume most of your fats in the form of monounsaturated fats. These are higher in omega-3 fatty acids, which have been linked to cardiovascular, anti-inflammatory, and mental benefits. Good sources of monounsaturated fats include fish, flax seeds, olive oil, avocado, nuts, and grass-fed meats.

Water

Water is extremely important and often overlooked. The human body is roughly 60 percent water, and muscles are about 70 percent water. Water is the main component of all the cells in the body and is vital for joint lubrication and the removal of toxins and waste. A good goal is to try and consume one gallon of water daily.

Supplements

With proper diet consumption, there is very little need for extra supplementation. Given the common American dietary habits, this can be easier said than done. Some key supplements to consider are vitamin D, fish oil, a multivitamin, turmeric, probiotics, glucosamine, and chondroitin. Supplements with excellent antioxidant and anti-inflammatory properties include ginger, tea (particularly green, white, and red tea), ginseng, vitamin E, coenzyme Q10, vitamin C, and resveratrol (found in red wine for example). Vitamin D and turmeric are probably the most beneficial on this list if you are consuming a relatively balanced diet rich in nutrient-dense foods. Regenexx does make a high-quality fish oil and turmeric supplement, but there are also other high-quality suppliers that can be found at your local health-food store.

Current Trending Diets

Intermittent Fasting (IF)

At its core, fasting is just voluntarily abstaining from food for a period of time. Fasting should not be confused with caloric restriction, in which the frequency of food consumption (i.e., 3–5 meals a day) is unchanged but the total calories consumed daily is restricted. Fasting also is not to be confused with starvation, which is usually involuntary and is associated with many detrimental physical and mental impairments and even death.

Intermittent fasting is loosely defined as abstaining from food for a designated window of time (i.e., time-restricted fasting between 12 to 21 hours), most commonly using the 16:8 method, which equates to 16 hours of consecutive fasting and 8 hours of food consumption. Some of the benefits linked with intermittent fasting include decreased blood pressure, decreased risk of diabetes, improved insulin sensitivity, improved fat burning and metabolic rate, improved cognition, higher levels of growth hormone, more cellular repair and waste removal, decreased amount of bad lipids in the blood, decreased Alzheimer's risk, and anti-aging benefits.

In regard to exercise and performance, many gravitate toward intermittent fasting for the improved metabolism, better body composition via fat loss, and higher growth-hormone levels to assist with muscle building. Some of the concerns are the potential for loss of muscle mass, but recent research on athletes utilizing the 16:8 method and resistance training has shown that IF in athletes does not reduce muscle mass or strength.

Ketogenic Diet

Nothing is new under the sun. This is particularly true for the ketogenic diet. Low-carb diets have been around for quite some time and initially became popular to the public in the 1990s as the Atkins Diet. The low-carb diet lost some of its initial popularity due to some bad research linking increased fat consumption with heart disease. The low-carb craze came back around as the South-Beach Diet by a cardiologist in 2003. A more recent resurgence of the low-carb movement has been branded as the ketogenic diet, which some would call an extremely low-carb diet, distinguishing it from the South Beach Diet, where you can consume up to about 140 grams of carbohydrates per day.

Carbohydrate consumption with the ketogenic diet is restricted to less than 50 grams per day. This type of diet initially was used in the 1920s for the treatment of epilepsy (recurrent seizures).

The premise of the ketogenic diet is getting the body into a state where it burns fat for fuel instead of the preferred fuel of carbohydrates. To accomplish this, the carbohydrates consumed must be very limited, and then the body converts fat into ketone bodies to be used for energy. The benefits of the ketogenic diet have been confirmed for weight loss, cardiovascular health, diabetes prevention, improving insulin resistance in those with diabetes, and the treatment of epilepsy. There is also emerging evidence that the ketogenic diet may be beneficial for cancer prevention, acne management, and many neurological disorders, including Alzheimer's, Parkinson's, and ALS.

Other Popular Diets

Other diets that may be beneficial include the Paleo Diet, Weight Watchers, the alkaline diet, and the Whole30, among many others. The key is finding something that you enjoy and can stick with for at least 30 days. Dieting is not marriage, so no need to feel bad if it just does not work out. I recommend using a calorie-counter app until you become very self-aware of what and how much you consume. No diet should be started if you have chronic health conditions without consulting with a medical provider.

For me dieting is simple: calories in equals calories out! Modify this simple equation to meet your needs for weight loss, weight gain, or maintenance. Start with small changes, like eating real food. If you do not recognize the ingredients listed, then do not eat the food.

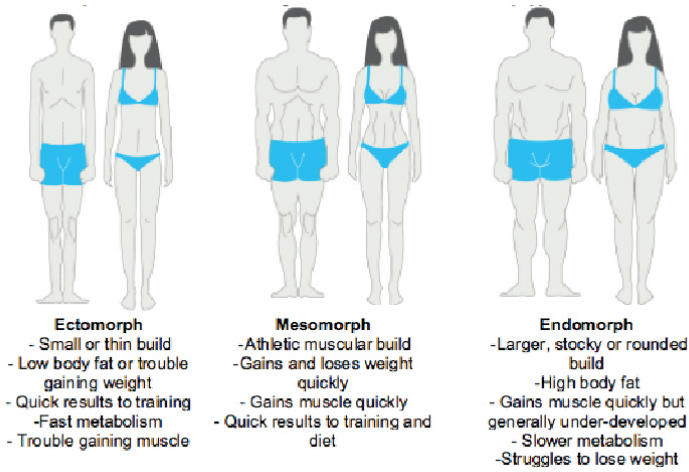
The overall key to diet and nutrition is lifestyle modification. No lasting success happens overnight!

Exercise Nutrition

The key is to eat a well-balanced meal one to two hours before and after a workout to meet all of your pre- and post-workout nutrition needs. Because blood flow to muscles proportionally increases while working out, increasing water intake is key while training. This will help improve circulation to large muscle groups and help decrease muscle fatigue and cramps. Some general caveats include:

- Those training to gain weight or muscle mass or for endurance purposes, should consider drinking a shake dense in proteins and carbohydrates during the workout.
- If your primary goal is fat burning or weight loss, consider training on an empty stomach to improve fat burning and supplementation with branched-chain amino acids to maintain muscle mass.

These simplified principles can be applied as a general rule of thumb and even applied to the three main body types.



The optimal body composition for fat burning is having a higher amount of muscle mass. Each pound of muscle burns 7 to 10 calories per day in comparison; the equivalent amount of fat burns 2 to 3 calories per day. This equates to a higher resting metabolic rate or more calories burnt at rest.

A few words on meal planning…either you plan ahead, or you plan to fail. Meal planning and preparation is the key to achieving your long-term goals.

The consumption of well-balanced meals before and after workouts have been shown to improve performance, increase and preserve muscle mass, speed recovery, and sustain energy during workouts. Once again, meal planning is key. Remember the 6 Ps: “Proper planning prevents piss poor performance.”

Chapter 4

The Blueprint

Everybody has a plan until they get punched in the mouth.
—Mike Tyson

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Bird's-Eye View

You may be wondering, *How much exercise is enough or recommended?* Honestly, no one knows, and there surely is not a consensus among the leading "experts." Most research shows, and experts agree, that doing some form of cardiovascular and strength training greater than four days each week for a minimum of 30 minutes will get you most of the associated benefits. An ideal exercise routine should be tailored to your specific goals and limitations.

See the training routines chapter (chapter 7) for a detailed written and visual description with pictures of how to complete basic and complex movements safely and correctly for all of the sections below (i.e., warm-up, interval training, plyometrics, strength and conditioning, and stretching) as well as chapter 5 "Pregnant and Fit" if it applies to you.

Crawl Before You Walk

Before you start to exercise, you have to look deep into who you truly are as a person. You must remember that all children learn to crawl before they walk. Babe Ruth didn't hit home runs the first time he swung a baseball bat. No one instantly knows how to exercise. If you learn to check your ego at the door, you will achieve peak physical fitness much faster.

What do we mean by checking your ego? We mean that you must come to grips with your body's physical limitations (acute or chronic) that you are dealing with currently. These limitations will be the guidelines that help you find the ideal exercises for your personal fitness goals. Recognizing what you know, and don't know, as a person/athlete is extremely difficult. Being able to say "I need some help" or "I need some instruction" is often the first step to exercising responsibly.

I have been dealing with a right-shoulder injury. Whenever I do any type of pulling motion, this aggravates my injury. My exercises have been limited to nonpulling exercises. This leaves me with a plethora of movements (burpees, squats, push-ups, etc.). Will this stop me from exercising at least 30 minutes a day five days a week? Absolutely not!

You must also learn to check your ego when it comes to complex dynamic movements. Not everyone is going to be able to clean and jerk, snatch, and so on from day one. These are extremely technical movements, and you must first break these movements into the basic components (e.g., front squat, dead lift, strict press, push press, push jerk) prior to actually executing the movements under load.

Learning to do basic movements without any load is the first step to crawling before you walk.

Warm-Up

Prior to every exercise session, a warm-up routine should be completed. The purpose of warming up is to increase blood flow to the muscles and improve the flexibility of the joints prior to placing a significant demand on the muscles, ligaments, tendons, bones, and joints. Ultimately, the goal is to minimize the risk of injury and improve performance. Research has shown that warming up prior to exercise can improve performance by nearly 80 percent.

Some suitable activities for warming up include the following:

- Cycling or stationary bike
- Light jogging
- Jumping rope
- Rowing machine
- Elliptical machine
- Calisthenics—push-ups, jumping jacks, burpees, squats, butt kicks, and high knees
- Indian clubs

To ensure that the core is actively engaged during the warm-up and workout, we also recommend doing a brief one to two minute activity prior to starting, to activate the transversus abdominis and multifidus muscles, which are key stabilizers of the spine.

Fitness and Conditioning

Fitness is composed of four basic elements:

- Strength
- Speed
- Stamina
- Flexibility

Exercise scientists made this list into 9 comprehensive all-encompassing terms in 1995.

I like to include stamina to make this an even 10. Below is a breakdown of the 10 components and some examples of how to test each component.

1. Strength—exerting force against resistance
    a. Bench press
        i. Barbell is the resistance
    b. Air squat
        i. Gravity is the resistance

2. Power—ability to move mass quickly over an amount of time
    a. Sled push
        i. Mass of your sled against gravity to a specific height
3. Stamina—the body systems' ability to process, deliver, store and utilize energy
    a. Incorporation of all of these elements into body systems to utilize energy efficiently
4. Agility—explosive movements in different directions
    a. Shuttle run
        i. Rapidly starting, stopping, and changing directions
5. Flexibility—ability to move to end range of motion in any major joint without reaching a physiological barrier
    a. Touching one's toes
        i. Tests the flexibility of the hamstrings
6. Balance—ability to control body position in space
    a. One-legged stance
        i. Tests the proprioception of the body
7. Local Muscle Endurance—single muscle's ability to perform
    a. Push-up tabata
        i. Tests the endurance of the pectoralis major and triceps muscles to perform a pushing motion

8. Cardiovascular Endurance—the ability of the body's energy systems to sustain effort over time
    a. The beep test, aka the multistage fitness test
        i. Measures an athlete's VO2 max while running 20m and back with decreasing time on the clock
9. Strength Endurance—exerting force against resistance over a period of time
    a. Abdominal conditioning test
        i. Establishes strength endurance (in relation to peers) after an athlete does 30 seconds of an exercise (normally sit-ups) and records the number of repetitions
10. Coordination—the ability of the body to coordinate motor functions with sensory functions
    a. Multiple computer tests can be used to gauge this now. This is a hot topic with concussion currently being in the spotlight. The SCAT 3 test incorporates a lot of coordination tests to determine if an athlete has been concussed on the field of play.

Conditioning is the ability of coordinating these items together in a complex way. As this pertains to exercise, this is the body knowing what to expect when doing a fitness movement.

Sport Training vs. Fitness Training

Individual sports require different aspects of fitness to excel.

For example, a tennis player would focus on these components of fitness (4 of the 10) to become successful:

- Agility
- Power
- Cardiovascular endurance
- Coordination

In comparison, a cyclist would focus on these components of fitness (3 of the 10) to become successful:

- Cardiovascular endurance
- Power
- Local muscle endurance

Do we believe that the others elements are unimportant? Absolutely not. We realize that when training for sport, we need to emphasize the fitness elements that will give the athlete the most success in competition.

Fitness training depends on the goals of the athlete as to which realm of fitness he or she interacts. When training for a particular sport, one should incorporate fitness component elements that the sport dictates for optimal performance. One size does ***not*** fit all!

Unique Training Types

High-Intensity Interval Training

Given the increasing time demands placed upon us in the developed world, many feel that they don't have enough time to exercise. I am a firm believer that we make time for the things that are important to us. We all get the same 24 hours a day; how you choose to utilize them is in your hands. Also, a new fitness trend has made squeezing in daily exercise for the busy professional even easier. High-intensity interval training (HIIT) was spawned from sprint-based training in the 1970s and has since evolved into several other variations.

The key theme with HIIT is maximum (or nearly maximum) exertion for brief intervals for a very short amount of time, followed by rest or low-intensity intervals. Utilizing an HIIT regimen, you can complete an intense workout in 4 to 30 minutes for three to five days a week and still reap the benefits observed from doing moderate-intensity exercise for 45 to 60 minutes five to seven days a week. HIIT done correctly can be very effective with a very low risk of injury. An annual survey conducted by the American College of Sports Medicine has ranked HIIT in the top-three workout trends since 2014, and, unsurprisingly, for 2018 HIIT ranks number one.

Plyometrics

Plyometrics is a training technique initially developed in the Soviet Union during the 1960s to improve the jumping ability of olympic athletes.

The term plyometrics was coined in 1975 by Purdue track and field coach Fred Wilt.

From its Greek roots, it translates into "increase the metric." This method is now widely used in sports training and involves a rapid stretching and contraction of major muscle groups in an explosive manner, leading to improvements in strength, power, metabolism, weight loss, and performance.

One of the most important benefits of plyometric training is that *no* equipment is required. Some general safety considerations include balance, stability, and proper technique.

I would recommend practicing these exercises first in their individual components very slowly and in a controlled fashion. Do this until the basic biomechanics of the movements are understood and correctly performed before progressing to the more complex patterns to prevent injury.

Examples of Plyometrics

- Box jumps
- High knees
- Squat jumps
- Ballerina squat jumps
- Jump lunges
- Clap push-up
- X-jumps
- Burpees
- Globe jumps
- Tuck jumps
- 180-degree floor jumps

Endurance Training

Endurance training focuses on aerobic activities in which the focus of the training involves the repeated contraction of large muscle groups. This type of training generates the same cardiovascular and other health benefits as mentioned in chapter 1 of this book. One of the other key features of endurance training is the prolonged submaximal effort utilized to slowly improve the anaerobic threshold over time. Slowly, the body adapts to the activity with repetition, and the trainee is then capable of increasing the exercise intensity and duration. Some great examples of endurance exercises or activities include running, swimming, cycling, rowing, cross-country skiing, speed skating, basketball, and football.

Gravitational Wellness

With the recent emphasis on the positive health benefits associated with strength training, the popularity of weight lifting has risen. Between 1998 and 2007, the number of people participating in weight lifting increased by almost 65 percent.

This increased popularity may be attributed to the benefits of the exercise, extending beyond increased strength. Resistance training has been shown to improve strength and speed of walking, ultimately resulting in higher scores on measures such as mobility and quality of life. As previously mentioned in chapter 1, research also suggests that resistance training has profound effects on the musculoskeletal system, including the prevention of osteoporosis, sarcopenia, and lower back pain.

Traditionally, muscle-strengthening exercise programs have adhered to the findings of Alexander Prilepin, a Russian weight-lifting coach and scientist. Given his findings, weight lifters are advised to use weights at 70–100 percent of their one-repetition maximum for optimal strength gains. For decades, these findings have served as the gold standard for strength advancement while receiving little viable opposition in literature. These findings have been validated by recent meta-analyses.

Despite the dominance of Prilepin's method for strength training, attempts have been made to explore the health benefits of strengthening programs that use weights outside of the intensity that he suggests. Several have suggested that the use of short arcs of range of motion may be useful. A novel weight-lifting program that uses the short-arc method and dramatically redefined the weights and interval suggested by traditional strength formulas is Gravitational Wellness (GW). This exercise program initially focuses on stimulating an area in the pelvis, which has been previously demonstrated to be critical to the development of power in martial arts and similar in location to the location of the qi in Eastern medicine. Studies have shown that participants in GW are able to rapidly progress weight lifted, leading to rapid weekly strength gains through 30-minute weekly training sessions. In one group of consecutive participants with an average age of 48 years, the median weight lifted after 10 sessions was 1100 pounds (498.95 kg).

GW is comprised of four specific exercises.

The first lift involves the use of a barbell attached to a hoisting belt. When attached, the participant is asked to bend at the waist and place his or her hands on an upper-body support structure. At this point, the participant is asked to flex at the waist to approximately 90 degrees. The hoisting belt is then placed over the lower back and upper pelvic region of the user. For this maneuver, the feet are approximately shoulder width apart with the knees bent to 45 degrees. With the belt placed over the lower back, the participant is instructed to inhale, hold his or her breath, and extend his or her knees from the starting angle of approximately 45 degrees to near-full extension, avoiding a locking of the knees (locking of the knees may result in injury). The lift is to be completed over approximately three seconds. Weights are added until the instructor detects that the form of the lift is faltering, thus indicating that the maximal weight-lifting capacity is being approached. After this lift, the weight is reduced by 30 percent, and the participant is asked to complete three additional repetitions, as a cool-down maneuver. The total number of lifts at this station average ten.

The second lift is performed using a barbell system positioned within a metal track, such that the starting point of a lift can occur with the patient's arms fully extended and the knees bent at 45 degrees. The participant's hands are placed in weight-lifting gloves, with the wrist attached to the barbell, so as to assist with the grip of the weights. The subject is asked to keep the back aligned in an upward position, to lean away from the bar at 15 degrees, and to retract the scapula. From this position, the knees are extended, and weights lifted for approximately three seconds. The weights are sequentially increased until the instructor again notes a faltering of form, indicating that the maximal weight-lifting capacity is being approached. With this weight achieved, the weight is reduced by 30 percent, and the subject is asked to repeat the extension maneuver for three additional repetitions.

The third lift is performed from a lying position using weight-lifting gloves. The weights are again positioned within a track system such that only up-and-down movements are permitted. The participant's position is such that the barbell is directly above the chin. The grip is slightly wider than shoulder width at the beginning position. A chest-press maneuver is then completed to full extension. As with the other exercises, weight is added until the subject demonstrates a faltering of form, indicating that the maximal weight-lifting capacity is being approached. When this weight is achieved, the weight is reduced by 30 percent, and the participant is asked to complete three additional repetitions.

The fourth lift is performed from a lying position using a barbell system contained within upright metal tracks. Wearing tennis shoes, the participant is instructed to lie on the mat, with the soles of the shoes placed at the midposition of the plantar fascia. The starting position is determined such that the knees are bent at a 45-degree angle. The participant is instructed to extend the knees, lifting the weights for less than 3 seconds. Weights are then added, as in the previous exercises, until the instructor determines that the subject's form is faltering, indicating that the maximal weight-lifting capacity is being approached. The weight is then reduced by 30 percent, and the subject completes three additional repetitions. At this reduced weight, the subject's foot is moved anteriorly and posteriorly on the bar such that the weight is lifted from contact positions just anterior to the calcaneus and two additional positions until a final lift at the metatarsophalangeal joint. The final maneuver, using the previously described positioning, occurs using the final weight, as previously described. The instructor asks the participant to lift the weights, while the barbell is slowly rotated by the instructor, moving the contact position of the foot from the metatarsophalangeal joint to the anterior calcaneus and back.

By use of short-arc range of motion and heavy weight resistance, our system emphasizes stimulation of the qi by allowing the weight to be transmitted through the lower dantian. By this method individuals have been able to achieve significant strength and wellness benefits with uniquely high weights and extremely low frequency of engagement.

In a study by Burke et al, by the 10th session, the average weight lifted in the belt lift for males and females had increased to 1336.7 lbs (606.32 kg) and 949.4 lbs (430.64 kg) respectively with no reported injuries during the weight-lifting session.

Other studies have indicated significant health benefits as well[7]. The majority of individuals present for GW to improve a specific health condition, often a musculoskeletal system complaint of the cervical or thoracic and lumbar spine. Benefits have been noted among those who have complained of chronic conditions resistant to treatment by more conventional methods. In one study, after finishing 10 sessions, the majority of participants reported an amelioration of back pain, with a mean reduction of over 80 percent as reflected by a Likert-scale improvement of 4.1 out of 5.

This is a hopeful finding as most studies of traditional exercise for chronic low-back pain have failed to demonstrate significant improvement. Participants have suggested a global improvement in health. In one study, subjects realized a mean gain in overall well-being of 4.27 out of 5 on the Likert scale[5]. A subsequent case series found a mean increase in bone mineral density of 6.1 percent and 15.3 percent in the lumbar spine and femoral neck respectively[5]. These results are intriguing, given that many are intolerant of medications aimed at osteoporosis.

As a tool to enhance athletic performance, this method was tested with athletes of an elite college baseball team, who were provided GW during their off-season. Individual batting statistics were collected for the season before and after the use of GW. Using the previous ten years of year-to-year performance change as a historic control, better performance was found in the GW group. As a team the GW group averaged a 17 percent improvement in batting average as compared to 0 percent improvement for the historic controls. As individuals, the average GW player realized a 39 percent improvement in batting average, compared to 13 percent improvement for the historic control.[6]

The GW data, while in its early stages, has demonstrated that untrained individuals can lift loads that are, before now, unimaginable, exceeding by multiple factors those that can be lifted by conventional techniques.[8] With minimal injuries, and multiple reports of health and performance benefits, GW seems to be an additional method athletic and performance improvement.

Group Training

No man is an island! Working out with others rewards the benefits of accountability and motivation. Whenever people train as a group, everyone wins. Community is one of our favorite influencers of health. Studies have shown that if a person is put in isolation, being in isolation is more detrimental to that person's health than smoking a pack a day for twenty years.

CrossFit

Otherwise known as functional fitness, this group-training class embodies the idea that competition will push an individual to become the best that he or she can be! The community will influence the athlete to be the best version of himself or herself through friendly competition. Functional fitness has the benefit of having small group classes that utilize a trained instructor with a preset strength workout and a fitness activity known as the workout of the day (WOD). The WOD is something that the whole community participates in individually throughout the day. Frequently, the rep schemes are done “for time” or for “as many reps as possible [AMRAP],” and this becomes the friendly competition of the day as the athletes try and beat each other’s times. The strength component helps multiple elements of fitness develop.

High-End Gyms

A lot of high-end gyms have taken the popularity that surrounds CrossFit (trademark) and incorporated this into their own group-fitness classes. As mentioned earlier, the American College of Sports Medicine has declared 2018 the year of high-intensity interval training (HIIT). A lot of successful personal trainers have banded together to offer similar fitness-type classes that incorporate a lot of the nine elements of fitness into group-style classes.

Orangetheory Fitness

This fitness strategy incorporates technology into fitness. At Orangetheory Fitness (OTF), athletes engage in a variety of different techniques, composed of running on treadmills, rowing, and various other core exercises, to achieve approximately 85 percent of their max heart rate, which is displayed on monitors for everyone to watch and monitor. This utilizes the community to push one another to new personal bests.

Other Great Group-Fitness Examples

Yoga classes take the participants through a series of poses that focus on moving with the participant's breath to get through the tough periods of the exercises. *Pilates* is a series of plyometric exercises done in a group class on a pilates apparatus. *Bootcamps* utilize a group to push participants through high-intensity intermittent training to maximize output. *Spin* classes, again, utilize the group to push each other to their limits while cycling. This is done through a series of three poses on a stationary bicycle and lasts for over 45 minutes to an hour.

Special Considerations

Over-50 Crowd

As the baby-boom population ages, the number of individuals over the age of 50 has risen on a record-setting pace over the last decade. Unlike the current adolescent and younger generation, the over-50 crowd wants to defy the stereotypes of not being active as we age and currently makes up the fastest-growing segment in the fitness population. People are continually looking for ways to maintain a functional level of health and quality of life as they age.

Several studies have shown the positive effects that exercise can have, such as decreasing frailty, sharpening mental skills, preventing osteoporosis, and providing many cardiovascular benefits. The key to exercising as we get older is simply working out smarter, or the modified KISS principle: *Keep it simple and safe!* The KISS principle is key to preventing injury in those new to working out, who have had a hiatus from exercise, or who currently exercise consistently and value longevity.

Remember these four simple principles and you should enjoy implementing and maintaining an exercise program well into adulthood:

1. Always have an initial evaluation by a medical professional prior to starting a new exercise regimen and regular maintenance checks if you have chronic health issues or if any new problems arise.

2. If exercising is new to your routine, start with a personal trainer to get a foundation of how to perform basic movements correctly and safely (e.g., a functional movement screen). Definitely disclose any health issues, limitations, and short- and long-term goals prior to starting as well.

3. Focus on the long game! Leave the competition for the eager and ego-filled young crowd at the gym. Have a clear idea of your personal goals, but there is no need to compete with others at this point.

4. Always listen to your body. It is okay to take a week off if that is what your body is telling you to do. Your body knows you and your limitations better than any personal trainer ever will.

The key areas to focus on when exercising should be core strengthening, posture, alignment, and flexibility. When done consistently, your physique and functionality will improve.

Preexisting Injuries

Even Superman is susceptible to kryptonite. Every person will at some point in life succumb to an injury, whether exercising regularly or not. Prevention is key, but managing injuries as they occur is critical as well. Here are some *dos and don'ts* for some common injuries that most of us experience either acutely or chronically.

- Lower-Back Pain
    - Lower-back pain usually occurs due to either a muscle strain, ligament sprain, myofascial dysfunction, pinched nerve/herniated disc, degenerated discs, instability, or arthritis affecting the spine.
    - Incorporate therapy with stretching and strengthening of the core muscles (e.g., multifidus and transversus abdominis), walking, yoga, Pilates, massage, dry needling, chiropractic care, or regenerative treatment options around the nerves or into the small joints (i.e., facets) in the back.
    - Avoid heavy lifting at the gym (dead lifts, squats, etc.), crunches, running, or overhead-lifting activities.

- Shoulder Pain
    - Shoulder pain is usually caused by impingement, inflammation, tearing of the rotator cuff tendons, arthritis, or referred pain from the neck.
    - Incorporate narrow-grip chest-press activities to minimize shoulder stress. Also add in exercises to strengthen the upper-back muscles (e.g., trapezius, rhomboids, latissimus dorsi, and posterior deltoids) to better stabilize the shoulder. Consider regenerative treatment options if conservative measures fail to provide relief.
    - Avoid overhead-lifting activities (e.g., overhead shoulder press) and wide-grip chest-press activities (push-ups and bench press).

- Neck Pain
    - Neck pain is usually caused by muscle tightness, old injuries causing instability (e.g., whiplash), arthritis, degenerated discs, pinched nerves, shoulder injuries, and poor posture (e.g., text neck).
    - Incorporate stretching to the posterior neck muscles, strengthening of the anterior neck flexors, acupuncture, dry needling, yoga, Pilates, massage, and chiropractic care. Consider regenerative treatment options if conservative measures fail to provide relief.
    - Avoid heavy lifting, poor posture (e.g., text neck), and high-velocity and high-impact activities due to increased risk of exacerbation or falling.

- Knee and Hip Pain
    - Knee and hip pain are usually related to arthritis, muscle weakness/imbalance, meniscus or labral tears, ligament sprains and tears, tendon inflammation, lower-back issues, and nerve pain.
    - Incorporate low-impact activities, such as pool therapy, cycling, and walking. Consider a knee brace. Work on strengthening the muscles in the lower leg, including the glutes, hamstrings, hip flexors, and quadriceps. Also focus on core strengthening and stretching. Modalities such as heat, dry needling, and acupuncture may be helpful. Consider regenerative treatment options if conservative measures fail to provide relief.
    - Avoid impactful exercises, unless a brace is used, and deep hip or knee flexion activities until you have been adequately evaluated.

Cool Down and Stretching

After taking part in some exercise, the best thing to do is have an appropriate cool-down period. Muscles, tendons, ligaments, and myofascial planes have all been strained after exercise. This is an opportune time to stretch these structures without causing any harm.

Cool-Down Benefits

- Reduces heart rate and respiratory rates
- Cools down body temperature
- Returns the muscles, ligaments, and tendons to tension-length relationships
- Stops blood from pooling in the extremities
- Returns other physiologic systems back to baseline

Stretching Benefits

- Lengthens tissues
- Decreases delayed-onset muscle soreness (DOMS)
- Increases mobility and flexibility

Preventing Injury

Prehab

Nearly 70 percent of musculoskeletal injuries are the result of overuse in the setting of muscular imbalances, largely from our industrialized lifestyles and sedentary ways. The concept of *prehab* is to prevent injury by focusing on strength and stability training of your most vulnerable areas while efficiently improving mobility and balance.

Prehab can be done prior to any sport (e.g., prior to the start of basketball season) or specific activity (e.g., hiking Machu Picchu) but should also be done on a regular basis throughout the week. Many prehab exercises are considered foundational and can be done with body weight only, during a brief three-to-five-minute session upon awakening in the morning or prior to doing any exercises after a long sedentary day at home, school, or work.

Importance of Sleep

Sleep and exercise are the yin and yang for overall health. After all, one-third of our lives is spent sleeping, so we need to take this time seriously and not overlook the benefits. Sleep is a foundational activity along with food and water, while exercise is a functional activity. However, both of these activities are intricately intertwined, and exercising has been positively linked with more-restful sleep and the prevention of chronic conditions, like sleep apnea, that affect millions of Americans. Additionally, sleep deprivation can also hinder cognitive and physical performance and alter insulin secretion to mirror that of a diabetic. Adequate sleep daily allows the body's repair mechanisms the appropriate time to regenerate tissues and allows for the removal of damaged cells and waste products. We should all strive for a minimum of seven hours nightly for optimal performance and health.

Chapter 5

After Injury

Once fundamental movement is managed, other factors like strength, endurance, coordination and acquisition of skill also play a role in prevention. Movement comes first. —Gray Cook

Christopher J. Williams, MD

Abby Perone, DC

Rehab After Injury

The common question that comes up when someone has an acute injury, has chronic pain, or is recovering from a procedure is, “How do I alleviate my pain?” The short answer is, we use any one or combination of modalities that assists in the body’s ability to heal itself. The body is an amazing organism with all the substrates and abilities of healing within; it’s just our job to allow it to fully express its healing ability.

How do I do that? you might ask. Well, the first step is understanding what the fundamental issue is…

Is it a pain issue?

- Issue: When pain is an issue, it’s important to address this first. Pain is a threat signal, telling the body that something is “wrong” so this elicits the body’s response. This response presents as altered-movement patterns that create a repetitive-movement change leading to muscle imbalance.
- Fix: Remove the threat of pain with pain-mitigating modalities of cryotherapy, heat therapy, TENS, movement correction, and so on.

Is it a tissue-length issue?

- Issue: The muscles and tissues around the affected area are short and tight. Common areas we see this in are the hamstrings, low-back, calf, quadriceps, chest, and arm muscles.
- Fix: Improve tissue quality and length with the modalities of manual therapy, stretching, myofascial release, and self-care.

Is it a joint-restriction issue?

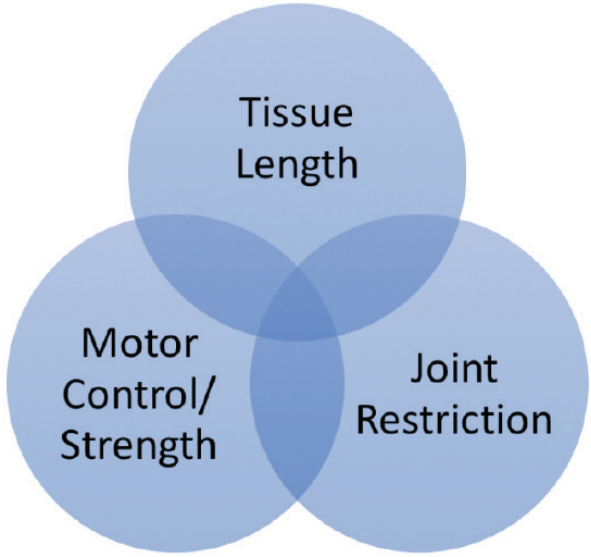
- Issue: A joint has lost its ability to have complete, isolated motion, causing a local (and possibly global) area to have lost mobility and range of motion. Common areas we see this is in are the shoulders, hips, ankles, and parts of the spine.
- Fix: Restore mobility to a joint that has lost its full range of motion with the modalities of joint mobilization, myofascial release, or stretching.

Is it a motor-control issues?

- Issue: A muscle, or group of muscles, has lost its ability to coordinate muscle impulses. This results in overutilization of certain common muscles and underutilization of other muscles. This is inherently a muscle imbalance that interrupts the body's use of proper muscles during repetitive-movement patterns. An example of this is the tendency to overutilize the bicep of the arm when the shoulder-blade muscles lose their ability to coordinate movement and stabilize. This is a common imbalance that leads to shoulder-pain conditions.
- Fix: Restore proper muscle-firing patterns, stability, and strength with the modalities of active joint mobilizations and active care exercises.

Or is it some combination of the issues above?

Your physical therapy professional should be exploring which of these items are at play with your symptoms, condition, or recovery needs. Then they know exactly how to use the tools of therapy and modalities to decrease pain, improve muscle and tissue mobility, correct faulty movements, and gain or rebuild strength. Below is a breakdown of the therapies and modalities that are commonly used in rehabilitation realms by physical therapists, athletic trainers, chiropractors, and other rehabilitation professionals.



Therapies and Modalities

Passive Therapies

Passive therapies are grouped as therapies in which the provider and patient are not actively performing the therapy—in other words, there is no energy expended by the clinician or patient in these therapies. *Passive* denotes that these therapies are rendered by an application of a machine or other tool.

Cryotherapy and Thermotherapy

Cryotherapy, or cold therapy, and hot therapy are the applications of a hot or cold pack on the skin to alleviate pain. Both cold and hot therapies alleviate pain by different means.

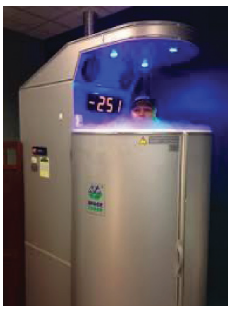
Cryotherapy

Cold therapy causes a constriction of local blood vessels, which slows the rate of blood flow. This effect of cold has an impact on reducing pain, swelling, and spasm. Cold therapy can be applied by way of a cold compress or by a technique of ice massage. A cold compress should be used with a towel, creating a barrier to the skin, and should be applied for 20 minutes on, 20 minutes off (allowing the skin to return to normal temperature), and 20 minutes on again.

Ice massage is an excellent technique for targeting more-focused areas, like the side of the elbow or the ankle bones, and should be used for 3–5 minutes directly on the skin with constant motion. This direct contact with the ice on the skin should be used with caution, not exceeding 5–7 minutes in one area, and never treating the areas beyond a sensation of numbness from the cold.

Cryotherapy Chambers/Whole-Body Cryotherapy (WBC)

Whole-body cryotherapy (WBC) is a treatment that involves sitting or standing inside a chamber while the whole body is exposed to cold temperatures to cool the skin down to reduce inflammation and pain. The chamber envelopes the body in cold air produced by liquid nitrogen, and the dose is 305 minutes of exposure to air ranging from -100 to -274 degrees F. The cold environment activates receptors in the skin that sense the outside environment and enhance the body's functions.



The entire process is designed to create a global, systemic cooling of the skin to create a global vasoconstriction, or narrowing, of the blood vessels during exposure to the cold. The vessel narrowing forces the toxins out of the area and allows the blood to be enriched. Then, as the body returns to the normal body temperature, the blood vessels open and the enriched blood flows back through the body.

This technology was developed in Japan in the 1970s to help alleviate the inflammatory pain associated with rheumatoid arthritis. In recent years, though, WBC has become very popular in *Cryospas* and *Cryosaunas* in the athletic recovery arena to help with reducing inflammation, improving tissue healing, and accelerating recovery.

This treatment is not FDA approved, and the clinical evidence of its claimed effectiveness on a wide array of physiologic benefits is weak beyond the possibility of it reducing inflammation. An ice bath would be a do-it-yourself alternative to this treatment.

Thermotherapy/Heat Therapy

Heat therapy is the application of a warm compress on the area of injury. This is often used in musculoskeletal-pain conditions to decrease pain and promote healing. The presence of heat on the tissues causes vasodilation of the blood vessels, resulting in an inflow of blood, carrying oxygen and nutrients while also facilitating the elimination of metabolic wastes that cause the sensation of soreness. The other effects of heat in therapy include increasing the ability of muscle and connective tissues to stretch, relieving spasm, decreasing pain, and reducing a feeling of stiffness.

Figure 1 below illustrates the physiologic responses to the applications of cryo and thermotherapies based on the symptom or desired goal for the treated area.

Figure 1:Pathophysiologic effects of topical modalities[1].

Ultrasound Therapy

Ultrasound therapy (US) is a passive modality that has been used in physical therapies since the 1940s. The therapy is rendered by a probe placed on the skin with a barrier of gel. The machine attached to the probe then produces sound waves that create a mechanical and thermal

	Cold	Heat
Pain	↓	↓
Spasm	↓	↓
Metabolism	↓	↑
Blood Flow	↓	↑
Inflammation	↓	↑
Edema	↓	↑
Extensibility	↓	↑

energy that renders a therapeutic effect. The US waves vibrate at a frequency (0.8–3.0 MHz) that causes a vibration of the local tissues. The vibration is considered to be created by the *piezoelectric effect,* meaning it takes electrical energy from the ultrasound machine and converts it to mechanical energy in the tissues. The type of mechanical energy, or vibration, can be either continuous or pulsed. If it's a continuous vibration, the patient will not sense a feeling of heat although the vibration generates heat through the vibration. If the patient has local inflammation from an acute or recent injury, generating heat with the continuous vibration is not desired, so a pulsed ultrasound wave is used instead.

In addition to producing vibrational waves that can stimulate healing to the tissues treated, it is found to have the effect of increasing local blood flow, relaxing muscle tissue, and even assisting in the vibration and release of scar tissue.

Conditions most commonly treated with US include tendonitis, nonacute joint swelling, and muscle spasm.

Electrical Stimulation Therapy for Pain

Electrical stimulation is often referred to as “e-stim” or “TENS,” which stands for transcutaneous electrical nerve stimulation. E-stim is most often used by physical therapists and chiropractors as a pain-management tool.

The theory of the pain-relieving application is that a mild and safe electrical current is passed through the skin to stimulate the nerves and muscles to create a feeling of relief. The pain-relieving application is called *interferential current* (IFC) and utilizes four electrodes in a crisscross pattern to apply a therapeutic stimulus to decrease pain.

Another application is called *neuromuscular stimulation* (NMES), which applies a more targeted impulse to cause a muscle to contract until fatigue and thus creates a resultant muscle relaxation. This effect is popular in the relaxation of muscle spasm.

These therapies are contraindicated for patients with pacemakers or cancer or for patients who are pregnant.

The clinical effects of e-stim have the strongest support in the realm of TENS, when targeted at pain relief, when compared to muscle reeducation applications.

Spinal Decompression

Spinal decompression therapy is also referred to as nonsurgical spinal decompression. Surgical spinal decompression includes procedures like microdiscectomies and laminectomies. These procedures are intended to create relief for pain generated in the spine from pressure on nerve roots. Pain in these conditions often presents locally at the neck or back but can also present peripherally in the limbs, as in the case of sciatic pain in the leg.

The mechanism of spinal decompression is to create a decrease in intradiscal pressure for two potential effects: 1) creating a suction effect within the disc to promote a reposition/malposition of the bulging disc material and 2) creating the same suction/lower-pressure effect within the disc center that promotes the influx of healing factors.

The effects of spinal decompression have been shown to be effective in providing relief, but not in comparison to other manual or interventions.

Inversion Tables

Inversion tables are tools that are often found in gyms or even homes. These tables are a relatively low-cost at-home intervention. You can strap in your feet and hang inverted in an attempt to relieve pain from spinal compression.

The results of these tables show some short-term relief through the decompressive effects on the spine and nerve roots, but they lack in demonstrating long-term relief of pain from spinal compression.

As mentioned above, this technique is a popular way for at-home relief but should be used with caution. Inversion for more than a few minutes can affect your heart rate and blood pressure. This should always be avoided by individuals with high blood pressure, glaucoma, or confirmed tears in the annular fibers of the discs.

Active Therapies

Active therapies are those that a provider *actively* performs on the patient. Active therapy denotes there is no active participation of the patient in their therapy; however, the provider performs treatments on the patient.

Examples of these therapies are IASTM, manual therapies, joint mobilizations, cupping, and acupuncture/dry needling.

Instrument Assisted Soft Tissue Mobilization (IASTM)

Instrument assisted soft tissue mobilization uses a tool made from steel, a metal alloy, plastic, or acrylic. Some popular brands/names associated with these tools are Graston®, gua sha, and fascia blaster. The tools are used with a clinical technique over the skin in and around the painful area to alleviate pain from a soft-tissue-related pain.

This technique works on the connective tissue, muscles, and mechanoreceptor nerve endings. The combination of applications helps to modulate pain by mechanically addressing the tissue but also by modulating a person's sensory experience of pain.

For example, if someone has knee pain, these tools would be used to treat the knee and also the tissues above the knee, in the thigh muscles, below the knee, and in the lower-leg muscles. In this treatment example, different depths of pressure and rates of using the tool cause a different output in the system. The major applications are for pain mitigation and improvement of the interlayer gliding between the layers of skin, subcutaneous fat, muscles, and connective tissue.

The main goal of this treatment is to decrease pain, improve tissue glide, improve tissue hydration, and improve function around an area of pain.

Manual Therapies

Manual therapy is a term that captures a wide array of therapies and is defined as treatments where the hands directly contact the body to treat joint articulations or tissues. These therapies are hands-on and are rendered by physical therapists, occupational therapists, chiropractors, massage therapists, athletic trainers, osteopaths, and osteopathic physicians to treat musculoskeletal pain.

Manual therapies usually include massage, muscle kneading, myofascial release, tissue work, and joint mobilizations to treat soft tissues and joint structures for the purpose of modulating pain; increasing range of motion; reducing soft-tissue inflammation; facilitating muscle-tone relaxation; improving tissue repair, extensibility, and/or stability; facilitating tissue movement; improving joint movement; and improving function. Further, manual therapies were reported to be in the top-three most commonly used interventions in the *complementary and alternative medicine* (CAM) realm. Some techniques that are well-known in the industry include Active Release Technique®, Rolfing, manipulation, and mobilization.

Joint Mobilizations

Manipulation

Joint *manipulation* is the act of using a high-velocity rotational or shear force to influence movement in a joint. Manipulations are often associated with a popping sound, or cavitation. The cavitation is from a release of gas from within the joint capsule.

Manipulations are performed by physical therapists, chiropractors, and osteopathic physicians. The objective of manipulations is to restore movement to a joint that has been restricted

Mobilization

Joint *mobilization* is a slow and controlled movement around a joint. This technique is focused on improving the elasticity in the joint capsule and the surrounding soft tissues. Elasticity around the joint allows for complete and healthy range of motion around a joint articulation. When a joint moves in its full range of motion, it prevents the surrounding structures from abnormal wear and tear, impingement, and stress.

Imagine a rotator cuff tear in the shoulder. Many times, the joint capsule of the shoulder loses tissue compliance in the capsule and surrounding tissues causing abnormal stress on the muscles of the rotator cuff. This can lead to injury.

An example of joint mobilization is called the Mulligan technique and is one application of *mobilization of movement*, where the provider takes a joint to its end range of motion while the patient also actively draws himself or herself into that end range. This technique helps to explore and mobilize end ranges of joint movement without protective barriers that are usually present.

Cupping

Cupping therapy is a version of myofascial decompression. This manual therapy is rendered by clinicians ranging from physical therapists, chiropractors, acupuncturists, and massage therapists.

Cupping is the process of using plastic, silicone, or glass cups with a vacuum seal to influence decompression between the layers of skin, muscle, and fascial tissue. Unlike the compressive forces that are typically applied during other forms of manual therapy (e.g., massage, joint mobilization, Graston®), negative pressure within the cup visibly lifts the skin away from the body.

The decompressive forces are then often coupled with a *shear* force in the tissues by adding in active range of motion of the patient while the cups are adhered to the skin or by adding in movement along the skin of the cups themselves.

Therapeutic tissue decompression is also referred to as myofascial decompression (MFD) and promotes the following physiologic benefits:

- Stimulates whole-body relaxation via tissue hypertonus downregulation
- Promotes blood oxygenation
- Promotes local detoxification and clearing of metabolic debris in muscle tissue, fascia, and skin
- Increases range of motion
- Decreases myofascial adhesions
- Promotes healing in scar tissue at a chronic injury site

Further, literature shows cupping to have effective benefits in the treatment of chronic pain related to myofascial pain.

Acupuncture/Dry Needling

Acupuncture and dry needling are the physiotherapy modalities that involve puncturing the skin with needles and penetrating the myofascial tissues to certain depths to illicit muscular, neurologic, and pain-relieving effects.

The main difference between acupuncture and dry needling is their origins and the techniques. Acupuncture has an ancient Eastern origin, and dry needling is a more recent Western application of the technique.

Acupuncture is the practice originating from Eastern medicine that focuses on therapy treating meridians in the body as mapped out by traditional Chinese medicine (TCM). The treatment of acupuncture can range from treating pain to autoimmune issues to stress and other issues patients seek relief from in complementary and alternative medicine. Acupuncture usually relies on multiple needles penetrating the skin shallowly along different points in the meridians with the goal of creating and achieving greater balance in the body.

Dry needling, or *intramuscular stimulation* (IMS), conversely, is usually isolated to the use of one needle at a time. The treatment is focused on trigger-point needling with a greater depth to treat a local area of dysfunction in the tissue and illicit a response. The responses desired are muscle relaxation and an increase in tissue perfusion through the activation of a local inflammation. The local inflammation thus brings healing cofactors to the area to stimulate a turnover in the local cells and promote healing. This set of responses in dry needling is intended to treat the tissues causing myofascial pain syndromes.

However, according to one research meta-analysis of the effectiveness of dry needling and acupuncture on myofascial pain syndromes, the illustration of benefits are limited and further research is needed with better controls and sample sizes in order to demonstrate its effectiveness. More studies are needed to illustrate the effectiveness of needling and acupuncture on the subjective and objective improvement of myofascial pain syndromes.

Home Care and Patient Education

The modern expectation of medicine is that clinicians practice evidence-based and outcomes-based medicine to keep up with accountable care and ensuring that healthcare dollars are going toward effective interventions, not just interventions for the sake of interventions. With that being said, this is a perfect time to bring up the pillars of *evidence-based medicine* that clinicians keep in mind when practicing medicine. The three pillars follow:

1. Provider expertise and experience
2. Integration of the best research evidence
3. Patient education

The marriage of all of these pillars is where the doctor sits down with the patient and illustrates their options to remedy their condition. This usually includes information around what their experience has shown to work best, what the literature shows about the interventions of possibility, and what the relative risks and alternatives of each step are. Further, this is where the clinician invites the patient into his or her own care and helps the patient to be fully informed in what the best option for the desired outcome may be.

In the realm of physical therapies specifically, an effective trainer, therapist, or chiropractor will also invite the patient to participate in his or her own care by learning more about the patient's structure and function and how to best accumulate more time in positions that are pro-function.

So, in short, the application of evidence-based medicine in rehab after injuries is when a therapist educates a patient on how to move better, because, as Thomas Meyers says, "Movement becomes habit, habit becomes posture, and posture becomes structure." So in order to correct the structure that could lead to acute or chronic injury, we educate our patients on how to best position their bodies to heal and prevent further injury.

Corrective Exercises, Postural Correction, Movement Reeducation

Movement reeducation is visual, verbal, and kinesthetic/hands-on movement reeducation. By utilizing the three forms of cueing, a rehabilitation professional assists in the motor relearning of both macro and micromovements in the body. Micromovements are as simple as relearning how to activate the core muscles and being able to breathe and control the core while doing a macromovement, like a squat for example. This retraining is in the isolation and coordination of muscle contractions that allow for healthy movement patterns.

Examples of this are in-office and home exercise programs that are focused on functional movements. The Corrective Exercise Specialist program developed by the National Academy of Sports Medicine is a program that follows the following process in an example of low-back pain:

1. Inhibit—utilize a self myofascial release tool like a foam roller or a tennis ball to "reset" the target tissue
    a. Example—foam rolling the leg and buttock muscles
2. Lengthen (when needed)—lengthen overly short and tight tissues by performing stretches affected areas
    a. Example—performing a figure-4 stretch to open up tight hips

3. Isolate—isolate by working on firing specific muscles and patterns
    a. Example—performing abdominal bracing exercises and glute activations to fire and “wake up” the target tissues
4. Integrate—progress functional rehab by adding in movements that demand greater coordination of muscles
    a. Example—performing glute bridges or squats to integrate a braced core with a functional movement across multiple joints

Post-Procedural/Post-Surgical Rehabilitation

Post-procedural rehab is a little bit different from rehab for acute and chronic pain. This rehab is designed to restore full range of motion and function after a procedure has been performed to fix an injured area (e.g., rotator cuff repair or a spinal disc repair procedure).

The following strategies are implemented gradually over a 6- to 12-week period:

- Strategies for pain reduction including modalities such as ice, heat, and electrical stimulation
- Passive and then active flexibility exercises to improve range of motion
- Exercises to strengthen muscles locally and in movement patterns
- Posture, balance, and coordination training
- Movement pattern retraining
- Manual therapy techniques
- Self-care training and home-exercise instruction for continued progress

Regenerative Medicine

Orthopedics is currently undergoing a paradigm shift where nonsurgical techniques using your own healing capabilities with things like PRP (platelet rich plasma) and stem cells are becoming mainstream alternatives to surgery. For more in-depth information on regenerative medicine for orthopedic problems (i.e., orthobiologics), read *Orthopedics 2.0* by Dr. Christopher Centeno.

Surgical Considerations

Outside of life-threatening emergencies, surgery should likely always be the option of last resort. As functional- and regenerative-medicine specialists, we strive to make sure you are performing at optimal health and function using the least-invasive techniques possible. If you are considering surgery, please speak with an interventional orthopedics specialist first to discuss all of your options prior to doing something that is not reversible. Our primary goal is always to provide you with the tools so that you can make an informed decision on your way to achieving your functional goals!

Chapter 6

During Pregnancy

The best way to keep your baby healthy is to keep yourself healthy.
—Gray Cook

Christopher J. Williams, MD

Layla Jaffree, MD

Pregnant and Fit

For so long, the idea of exercise during pregnancy has been fraught with unsupported anecdotal theories that have negatively shaped what society and women in particular viewed as acceptable. Up until the late 1970s, it was widely accepted that the pregnant woman was fragile and should not exert more energy than was required to do her daily light house chores.

The 1970s was the era of the health and fitness boom, which led to more interest and research surrounding prenatal exercise.[1] Since then, ideals surrounding exercise and pregnancy have, unfortunately, not changed a whole lot, mainly due to the lack of new research surrounding the topic. *It's hard to get scientists to agree to conduct studies on pregnant women!* However, the American College of Obstetricians and Gynecologists (ACOG), a prominent organization devoted to the research of women's health, has, over the years, revised their stance on exercise during pregnancy, stating, "Despite the fact that pregnancy is associated with profound anatomic and physiologic changes, exercise has minimal risks and has been shown to benefit most women. Women with uncomplicated pregnancies should be encouraged to engage in physical activities before, during, and after pregnancy."[2]

Although research has a long way to go to catch up, it is currently well accepted that 30 minutes per day of some form of moderate regular exercise *for most days of the week* before, during, and after pregnancy is optimal.[3] Also, there has not been any evidence to support any harmful effect of high-intensity exercise being continued in women who engaged in this type of exercise prior to pregnancy, like female athletes.[4] So far, what research we do have has shown several benefits of incorporating exercise throughout all stages of pregnancy. Given that there is no research supporting one particular type of exercise to do in pregnancy, one way to approach exercise is to look at the fact that women come in all shapes and sizes, so there is probably no one-size-fits-all exercise in which pregnant women should engage

This section of *Exercise 2.0* will provide a glimpse of what we know can happen without adequate nutrition and exercise during pregnancy. It will then give an explanation of physiologic changes that occur during pregnancy while providing a blueprint for an exercise strategy that any pregnant woman can employ throughout the third trimester.

The Bad and the Bad

Obesity is the most common healthcare problem affecting reproductive-age women. In the U.S. in 2014, an estimated 70.7 percent of adults were either overweight or obese.[5] Not only does being overweight contribute to the acquisition of several chronic diseases and long-term health issues, but its impact can also lead to serious health risks for both the pregnant woman and her fetus just within the 10 months of pregnancy.

Obesity increases the risk of morbidity during pregnancy, including reduced fertility, miscarriage, stillbirth, birth defects, gestational diabetes, pregnancy-induced hypertensive disorders, cardiac dysfunction, nonalcoholic fatty liver disease, sleep apnea, labor complications, infant birth trauma, longer labor, increased rate of labor induction, cesarean delivery, and post-delivery complications, including hemorrhage, infection, and prolonged wound healing, to name a few.[6] Optimal management of body weight starts before conception; however, effective weight management during pregnancy can significantly reduce the risk of adverse pregnancy outcomes (e.g., gestational diabetes, pregnancy-induced hypertensive disorders, fatty liver disease, and increased rate of cesarean delivery).

The Institute of Medicine has developed guidelines for recommended weight gain during pregnancy based on a measure of prepregnancy weight known as the body mass index (BMI). A high BMI correlates with excessive body weight and is considered a predictor of poor health. Dietary restrictions, exercise, and behavior modifications have all been recommended to limit excessive weight gain during pregnancy.

Recommendations For Total and Rate of Weight Gain During Pregnancy By Pregnancy Body Mass Index (BMI)			
Prepregnancy Weight Category	Body Mass Index	Recommended Total Range of Weight Gain (lbs)	Recommended Rates of Weight Gain in the 2nd and 3rd Trimester (lbs) (Mean Range lbs/week)
Underweight	Less than 18.5	28–40	1 (1–1.3)
Normal weight	18.5–24.9	25–35	1 (0.8–1)
Overweight	25–29.9	15–25	0.6 (0.5–0.7)
Obese (All Classes)	30 and greater	11–20	0.5 (0.4–0.6)
Calculations assume a 1.1–4.4lb weight gain in the 1st trimester.			

Derived from Gabbe, S. G., Niebyl, J. R., Simpson, J. L., & Anderson, G. D. (1991). *Obstetrics: Normal and problem pregnancies.* New York: Churchill Livingstone.

The Why and What

Logistically, during pregnancy, exercise intensity and frequency should be maximized during the first and second trimester as tolerated. This is because during the early half of the pregnancy, the body has the least amount of major structural change from the growing uterus. Although there are significant changes going on within (e.g., major changes to the cardiovascular system), mobility is minimally impacted during this time period. This will also increase the likelihood of a smoother recovery after the pregnancy during the postpartum period. In other words, stack your deck early when you have the most energy and are feeling the best that you will probably feel throughout the pregnancy.

Several studies support exercise improving the outcome of labor and delivery.

Fit women tend to have shorter labors, less-complicated deliveries, and a lower risk of cesarean delivery. Women who exercise also have a lower risk of depressive symptoms during and after pregnancy and have a higher likelihood of shedding those pregnancy pounds.

The Plan

1. First Trimester (1–13.6 weeks)
    a. Major physiologic changes and symptoms
        i. Nausea, vomiting, fatigue, cramping, and changes in blood volume may occur.
        ii. Many women maintain or even lose weight during this period.
    b. Recommended exercises and frequency
        i. Stay hydrated with at least 64 ounces of water per day, eat well-balanced meals, and get plenty of rest.
        ii. Usually can maintain pre-pregnancy exercise intensity or increase intensity gradually if none or limited exercise prior to pregnancy.
        iii. Exercise should be a good balance of cardio, strength building, and core.
            1. Core exercise is extremely important during this time as it is important to strengthen the muscles that will support the progressively enlarging uterus and will also prevent significant strain to the back muscles. As the pregnancy progresses, it may become more difficult to target the core muscles, so this is the optimal time to employ preventative techniques.
            2. Kegal exercises are important to start.

2. Second Trimester (14–27.6 weeks)

    a. Major physiologic changes and symptoms

        i. Ligament laxity from hormonal changes increases, total blood volume in the body increases, uterus expands. Nausea and vomiting usually improve.

        ii. May experience back or pelvic pain and Braxton Hicks contractions (especially if fluid intake is inadequate).

    b. Recommended exercises and frequency

        i. Continued exercise with some modifications: avoid lying flat on the back for prolonged periods of time, lying on the abdomen, and exercises or sports that have an increased risk of trauma to the abdomen. Always take breaks as needed, and stop exercise if you begin to feel light-headed or weak.

        ii. Always stretch before and after exercise to minimize risk of injury.

3. Third Trimester (28–40+ weeks)

    a. Major physiologic changes and symptoms

        i. Uterus continues to grow and curve, and lordosis in the lower back increases due to the abdominal enlargement. Ligament laxity increases to prepare for delivery. Shortness of breath increases from increasing weight and more pressure from the growing uterus on the lungs. Fatigue may return.

        ii. Back and joint pain, especially in the hips, may increase (studies indicate more than 60 percent of women report low-back pain).

iii. Balancing may be more difficult as the center of gravity has shifted.

iv. Risk of dizziness or fainting increases, especially with prolonged periods of standing or transitioning quickly from sitting to standing.

b. Recommended exercises and frequency

i. Continued exercise with modifications. Running, jolting, or jumping exercises may be more difficult.

ii. Avoid certain abdominal exercises, like crunches, as this can contribute to separation of the abdominal muscles in a condition called rectus diastasis.

iii. Consider more strength-building and stretching exercises here and stationary cycling or swimming for aerobic exercise. If fatigue is a significant issue, consider shorter interval exercises with increasing frequency (e.g., 10–15 minutes exercise length multiple times per day or more days per week).

4. Postpartum

a. The postpartum recovery period will vary depending on events that occurred during labor and delivery, especially between vaginal versus cesarean delivery types. Women who had a cesarean section will have a longer recovery period than those who delivered vaginally. Additionally, women who had trauma to the pelvic floor during delivery will have a different recovery course than those without any intervention or trauma.

b. Major physiologic changes and symptoms

i. The uterus size drastically decreases, back pain can be a common complaint, wounds need at least 4–6 weeks to heal.

c. Recommended exercises and frequency

    i. For women who had a cesarean section

        1. It is advised to wait the entire recovery period after obtaining medical clearance prior to resuming vigorous exercise.

        2. Walking is, however, usually recommended during this time.

    ii. For women who had a vaginal delivery with perineal trauma/laceration

        1. Acute postpartum period (first 1–2 weeks): Use this time period to rest, bond with your baby, and acclimate yourself to your baby's sleeping and eating patterns. There are two major exercises to start as soon as you feel ready.

            a. Kegel exercises: As soon as you feel comfortable, begin the practice of Kegel exercises 3–5 times daily, as this will aid in the recovery of your pelvic muscles and assist with a quicker return to function.

            b. Transversus-abdominis strengthening: This exercise helps with separation of the abdominal muscles.

1. Subacute postpartum period (3–4 weeks): If you feel up to it, start regular stretching exercises targeting the back, pelvis, and core. (Yoga is an excellent exercise modality for this.)

2. Six weeks and beyond: Plan to resume regular or pre-pregnancy exercise regimen. Start with light exercise and gradually increase intensity. The key here is consistency.

Remember the following:

- **Safety is paramount!**
    - Discontinue any exercise that is excessively uncomfortable or leads to feelings of shortness of breath or faintness.
- Exercise sessions need not be lengthy. It's the quality that counts!

Chapter 7

Exercise Demonstrations and Training Routines

I am the Greatest. I said that even before I knew I was.
—Muhammad Ali

Christopher J. Williams, MD

Ron Torrance, DO

Layla Jaffree, MD

Abby Perone, DC

Use the training routines that follow not only as a foundation to learn and master the basic movements but also as a means to challenge yourself on your journey to peak function and performance.

The training routines are a good starting place, but as you become more comfortable with the movements and exercises, challenge yourself to build more complex training routines of varying difficulty.

Enjoy and remember…*Motion is Lotion*!

Core Activation

Primary Muscles
Transversus - Abdominis
Secondary Muscles
Obliques Rectus abdominals Erector Spine Muscles Posterior Deltoid Rhomboids

KEY POINTS

Avoid twisting the pelvis or torso.

Do prior to warming-up for exercise.

BENEFITS

Improves core stabilization and helps prevent injury.

1. **Transversus Abdominis Activation:** In a seated position, concentrate on pulling in the belly button towards the spine and holding it in this position for 5 to 30 seconds.

MODIFICATION

This exercise can be modified by lying on your back on the floor and pulling in the belly button towards the spine or ground and holding for 5 to 30 seconds if you have hip or knee issues.

Primary Muscles
Paraspinals
Secondary Muscles
Glutes Hamstrings Calfs

KEY POINTS

Avoid twisting the pelvis while extending the leg

Do prior to warming-up for exercise.

BENEFITS

Improves core stabilization and helps prevent injury.

2 **Multifidus Activation Beginner Standing:** Stand with you feet shoulder width apart and place your thumbs on your back muscles next to your spine.

Extend one leg at a time and make sure that you are contracting the spine muscles throughout the entire movement of your leg from the extended position back to the starting position.

MODIFICATION

This exercise can be modified by placing one hand on a wall, chair, or countertop to assist with stability in those with balance difficulty.

Core Activation

Primary Muscles
Paraspinals
Secondary Muscles
Deltoids
Triceps
Glutes
Hamstrings
Calfs
Obliques
Quads
Hip Flexors

1 **Transversus Abdominis Activation:** In a seated position, concentrate on pulling in the belly button towards the spine and holding it in this position for 5 to 30 seconds.

MODIFICATION

This exercise can be modified by lying on your back on the floor and pulling in the belly button towards the spine or ground and holding for 5 to 30 seconds if you have hip or knee issues.

KEY POINTS

Avoid twisting the pelvis while doing the movements and keep the spine straight. Master the movement for each step before progressing.

Do prior to warming-up for exercise.

BENEFITS

Improves core stabilization and helps prevent injury.

2 **Multifidus Activation Beginner:** In the kneeling position while elevating one hand off the ground for 1 inch, also elevate the opposite knee off of the ground for one inch at the same time. Hold for 5 to 30 secs. Repeat 5 to 10 times.

3 **Multifidus Activation Intermediate:** While on your knees with your hands on the mat shoulder width apart, extend one leg until straight and hold in this position for 5 to 30 seconds. Repeat 5 to 10 times.

4 **Multifidus Activation Advanced:** While on your knees with your hands on the mat shoulder width apart, extend one leg until straight and extend the opposite arm and hold in this position for 5 to 30 seconds. Repeat 5 to 10 times.

5 **Multifidus Activation Advanced:** From the standard plank position, extend one leg until straight and extend the opposite arm and hold in this position for 5 to 30 seconds. Repeat 5 to 10 times.

Warm-Up

1. **Butt Kicks:** Run in place but also bring the heels as close to the butt as possible.

2. **Jumping Jacks:** From a standing position bring the arms overhead from the side position while also spreading the feet apart.

Modification

Instead of bringing the arms up from the side, bring them up from the front instead. This is key if you have shoulder issues.

Primary Muscles

All muscles involved

KEY POINTS

Do each of these exercises for 1 minute.

BENEFITS

Improves blood flow to all of the major muscles. Doing this routine prior to starting the workout may help prevent injury.

Additional exercises can be added in or substituted such as push-ups, toe touches, and high knees.

3 **Chest Expansion with Scissors:** In a standing position move the legs from front to back while also bringing the arms in and out touching the palms together.

4 **Lateral Lunge:** From a standing position extend one leg coming to a squat position while paying key attention to proper squat technique and not extending the knee beyond the toes. Switch to the opposite side.

Core

Primary Muscles
Core
Secondary Muscles
Biceps Shoulders Forearms Legs

1. **High Plank:** With the arms fully extended and shoulder width apart and the ankles together, there should be a straight line from the shoulders down to the feet.

   • Avoid dipping in the hips or elevating the butt once the core starts to fatigue.

   • Start with holding in the plank position for 20– 30 seconds and increase the time by 10 – 15 second intervals.

   • The goal time is to hold for 2 consecutive minutes.

   Modification:

   For an easier variation, place the knees on the ground and hold in this position.

KEY POINTS

Core is the most integral part of working out and long-term injury prevention.

2. **High Plank with Oblique Crunch:** From the high plank position bring the knee up to touch the elbow on the same side and then back down to the starting plank position. Repeat this movement on the opposite side.

3 **Low Plank:** With the arms bent at 90 degrees and shoulder width apart and the ankles together, there should be a straight line from the shoulders down to the feet.

• Avoid dipping in the hips or elevating the butt once the core starts to fatigue.

• Start with holding in the plank position for 20– 30 seconds and increase the time by 10 – 15 second intervals.

• The goal time is to hold for 2 consecutive minutes.

• This is a good alternative if you have baseline wrist or shoulder issues.

Modification:

For an easier variation, place the knees on the ground and hold in this position.

4 **Low Plank with Oblique Crunch:** From the low plank position bring the knee up to touch the elbow on the same side and then back down to the starting plank position. Repeat this movement on the opposite side.

Do as many repetitions as you can in 1 minute.

Core

1 **Core Extension:** From the starting position of lying down on your stomach with your hands extended in front of you, extend your body up from the core and extend the elbows while simultaneously coming up on the toes as well.

• This is an extremely difficult exercise and requires significant core and upper body strength.

• Do not attempt if you have lower back issues.

Primary Muscles
Core
Secondary Muscles
Biceps Shoulders Forearms Legs

KEY POINTS

Core is the most integral part of working out and long-term injury prevention.

2 **In and Out Abs:** In a seated position with the legs extended and the heels elelevated off of the ground, bend the knees in towards the chest and then extend the legs back out.

• For a more difficult variation, with the legs extended, raise the legs without bending the knees while also bending the torso forward in a crunching motion.

• An easier variation is the same motion but the palms are placed on the floor for improved stability.

Primary Muscles
Core

KEY POINTS

Core is the most integral part of working out and long-term injury prevention.

Do 3 sets with 5 – 15 repititions.

Core

1. **Hollow Hold:** The lower back is flat on the ground and the legs are extended and the shoulders are elevated off of the ground. Hold in this position 10 – 30 secs. A goal would be able to hold for 1 minute.

Primary Muscles
Core
Secondary Muscles
Biceps
Shoulders
Forearms
Quadriceps
Hamstrings

KEY POINTS

Core is the most integral part of working out and long-term injury prevention.

Do 3 sets with 5 – 15 repititions.

2 **Medicine Ball Twists:** In the seated position with the knees slightly bent and the heels on the ground, hold a medicine ball in your hands in front of the chest with the elbows flexed to 90 degrees. Twist the core from side to side while not moving the legs.

Consider using a heaver medicine ball.

3 **Advanced Medicine Ball Twists:** In the seated position with the knees slightly bent and the heels on the ground, hold a medicine ball in your hands in front of the chest with the elbows flexed to 90 degrees. Twist the core from side to side while not moving the legs.

A more difficult variation involves keeping the legs extended and off of the ground during the exercise.

Core

1. **Superman Hold:** With the abdomen on the ground, elevate the legs with the heels together off of the ground and the chest off of the ground. Keep the arms straight with the palms down. Hold for 10 – 30 seconds. A goal time would be to hold for 1 minute.

   A variation of this workout involves keeping the arms straight ahead in front of you, which may be more comfortable if you have shoulder issues.

   Modification

   To make this exercise slightly easier, lower the chest and feet back down then back up in a pulsing manner.

Primary Muscles
Core
Secondary Muscles
Biceps
Triceps
Shoulders
Forearms
Quadriceps
Hamstrings

KEY POINTS

Core is the most integral part of working out and long-term injury prevention.

2 **Bridge:** From a seated position, lift the butt completely off of the ground bringing the core up to a parallel position and hold here. Do 3 sets with 5 – 15 repetitions.

A more difficult of this variation involves holding one leg up while maintaining the bridge position.

3 **Knee to Elbow Planks:** From the high plank position, take the left knee and bring it towards the right elbow and then return to the plank position and repeat on the opposite side. Do 3 sets with 5 – 15 repetitions.

An easier variation involves bring the right knee towards the right elbow without crossing the body, then repeating on the left side.

Core

1 **Ab-Wheel:** In a kneeling position with the ab wheel on the ground and the back straight, extend the arms until almost touching the ground and then roll the wheel back towards the knees while keeping the back straight.

A variation to focus on the oblique abs is completed by twisting to the right side when extending the arms, coming back to the starting position and then twisting to the right side.

Primary Muscles
Core
Secondary Muscles
Biceps
Triceps
Shoulders
Forearms
Quadriceps
Hamstrings

KEY POINTS

Core is the most integral part of working out and long-term injury prevention.

2 **Advanced Ab-Wheel:** From the standing position and flexed at the hip and the knees extended, place the ab-wheel on the ground and then extend the arms while keeping the core activated and back straight. Extend in a controlled fashion until the abdomen touches the ground and then stand up and repeat.

A more difficult variation of this exercise involves not touching the abdomen on the ground and from a fully extended position the ab-wheel is rolled back towards the feet until reaching the starting position.

Core

Primary Muscles
Core
Secondary Muscles
Quadriceps Glutes

KEY POINTS

Core is the most integral part of working out and long-term injury prevention.

1. **Scissor Abs:** While lying down on your back, extend the feet off of the ground approximately 6 inches and then elevate one leg at a time up and down in a scissoring motion. The neck and head remain on the floor during the exercise.

   A more difficult variation involves keeping the head and shoulders elevated off of the floor during the exercise.

2. **Crossed Scissor Abs:** While lying down on your back, extend the feet off of the ground approximately 6 inches and then spread the legs widely while keeping the feet elevated. Next then cross the right leg over the left leg and then return to the starting position. Repeat with the left leg then crossing over the right leg.

   A more difficult variation involves keeping the head and shoulders elevated off of the floor during the exercise.

3 **Single Leg Raise:** While lying down on your back elevate the feet approximately 6 inches off of the ground and also elevate the head and shoulders off of the ground. Raise the left leg to approximately 90 degrees and then back down while keeping the right foot elevated off of the ground.

A more difficult variation involves flexing at the waist and bringing the opposite hand to touch the foot that is flexed then lower the torso back down without touching the shoulders or head down to the ground.

An easier variation involves resting the non-moving leg on the ground while completing the motion on the opposite side and then switching sides.

Core

1 **Side Plank:** While lying on your side, extend the hip off of the ground. Hold in this position for 15 – 30 seconds. A goal is to hold for 1 – 2 minutes.

Primary Muscles
Core
Secondary Muscles
Quadriceps Hamstrings Glutes

KEY POINTS

Core is the most integral part of working out and long-term injury prevention.

2 **Tilt Back on Knees:** Start in a kneeling position and tilt back as far as you can while keeping the core straight. Hold for 5 – 20 seconds.

Bodyweight – Chest

Primary Muscles
Pectoralis (Chest) Triceps
Secondary Muscles
Core Biceps Shoulders Forearms

1 **Push-ups:** The starting position is a high plank with the arms and legs shoulder width apart with the core muscles activated and the palms flat on a hard surface. The ending position is accomplished by flexing the elbows bringing the chest closer to the ground. Pay close attention to avoid bending the elbows greater than 90 degrees to prevent placing excess force on the shoulder joint and rotator cuff tendons.

Modification

Adjust the position of the hands to focus more on the medial or lateral portion of the chest muscles (e.g. diamond push-ups for more medial chest focus). The closer the hands then the more activation of the triceps muscles also.

An easier variant for beginners can be done with the knees placed on the ground.

KEY POINTS

Keep the core tight during the entire motion.

Avoid bending the elbows greater than 90 degrees to prevent excess strain on the shoulders.

Start with 3 sets of 5 – 10 repetitions.

BENEFITS

Push-ups is one of the essential bodyweight exercises that is great for strengthening, conditioning, and stability training.

2 **Push-up Variations:** Several variations can be accomplished which can increase difficulty. Some examples include:

Finger tip: Use the same motion as the standard push-ups except your fingertips are in contact with the ground and NOT the palm of the hands. This variant is great for strengthening the forearms and small finger muscles.

Lateral rotation: When coming back up from the ending position, rotate one arm back for additional activation of the back muscles and more stabilization training.

One arm: Use the same motion as the standard push-ups except only one arm is in contact with the ground (palm flat) and the feet have an enlarged width apart for improved stability. This variation is the most difficult and should only be attempted after mastering the other variations since significant upper body and core strength is required.

Bodyweight – Chest

1. **Decline Push-ups:** Rest your feet on a stable elevated surface (bench, chair, box) and then proceed to do a push-up in this position. This variation tends to work the lower chest muscles. The steeper the decline, the more difficult this becomes.

2. **Incline Push-ups:** Rest your hands on the edge of a stable surface and then proceed to do a push-up in this position. This variation tends to work the upper portion of the chest muscles. The steeper the incline the easier this becomes.

Primary Muscles
Pectoralis (Chest) Triceps
Secondary Muscles
Core Biceps Shoulders Forearms

KEY POINTS

Keep the core tight during the entire motion.

Avoid bending the elbows greater than 90 degrees to prevent excess strain on the shoulders.

Do 3 sets of 5 – 10 repetitions.

BENEFITS

Push-ups is one of the essential bodyweight exercises that is great for strengthening, conditioning, and stability training.

3 **Towel Fly:** From a low push-up position with a large towel placed under your hands, elevate the body to a starting position by sliding the palms of the hands towards each other. At the end position, the elbows are fully extended.

Weighted – Chest

1. **Flat Bench Press:** The starting position is lying on your back on a flat bench with a dumbbell, barbell, or kettlebell is placed into both hands. The weight is then lowered down to the chest and then pushed back up to the starting position.

   To make this more difficult or challenging consider adding more weight. One can also add bands or chains to make the resistance variable as the person completes the repetition.

   Incline Bench Press Variation (not shown): Elevate the bench on a box or use a bench that has different elevations to get a good burn in the superior portion of the pectoralis major muscle while engaging different portions of the anterior deltoid.

   Decline Bench Press Variation (Not shown): There are benches that allow for the chest to be below the hips. This really works the inferior portion of the pectoralis major muscle.

Primary Muscles
Pectoralis (Chest)
Triceps
Secondary Muscles
Core
Biceps
Shoulders
Forearms

KEY POINTS

Keep the core tight during the entire motion.

Avoid bending the elbows greater than 90 degrees to prevent excess strain on the shoulders.

Do 3 sets of 5 – 10 repetitions.

BENEFITS

Push-ups is one of the essential bodyweight exercises that is great for strengthening, conditioning, and stability training.

Bodyweight – Back

Primary Muscles
Latissimus Dorsi Teres Major
Secondary Muscles
Core Biceps Shoulders Forearms

1 **Pull-ups:** Grab a pull up bar with both palms of your hands facing away from the body. Pull your body up from the hanging position until your chest touches the bar. If this is not possible use a rubber band to assist in upward movement to aid the range of motion. (not shown)

KEY POINTS

Keep the core tight during the entire motion.

These exercises are the basis for back muscle workouts.

Do 3 sets of 5 – 10 repetitions, add weighted vests or put weights between the feet if the last rep is not difficult

BENEFITS

Pull ups and chin ups are some of the best exercises for a person to do.

2 **Chin ups:** Grab a pull up bar with both palms of your hands facing toward the body. (picture on left at top) Pull your body up from the hanging position until your chest touches the bar. (picture to the left on bottom) If this is not possible use a rubber band to assist in upward movement to aid the range of motion. (not shown)

Bodyweight – Biceps

1 **Biceps Push-up:** From the low plank position, lean forward to bring your shoulders as close to your wrists as possible.

Primary Muscles
Biceps
Secondary Muscles
Triceps Core Upper Back Forearms Legs

KEY POINTS

Keep the core engaged during the movement to improve stability.

Keep the elbows close to the body to decrease the upper back muscle activation to truly focus on the biceps.

Start with 3 sets of 5 – 10 repetitions.

BENEFITS

Great way for increasing the tone and size of the biceps without lifting heavy weights.

2

Pronated Biceps Curl: With the forearm in a pronated or palms down position, hold on to a bar. The starting position is with the elbows fully extended (not shown) and then the elbows are flexed bringing the chest closer to the bar.

Note that the bar is securely rested on a chair in this photo. Ensuring that the bar is stable is extremely important to prevent an injury.

3

Supinated Biceps Curl: With the forearm in a supinated or palms up position, hold on to a bar. The starting position is with the elbows fully extended (not shown) and then the elbows are flexed bringing the chest closer to the bar.

Weighted – Biceps

1. **Bicep Hammer Curls with Dumbbells:** From the standing position with the elbows extended, the arm is then flexed to the end range of motion.

   Can also be done with a weighted barbell as well.

Primary Muscles
Biceps
Secondary Muscles
Triceps Core Upper Back Forearms Legs

KEY POINTS

Keep the core engaged during the movement to improve stability.

Keep the elbows close to the body to decrease the upper back muscle activation to truly focus on the biceps.

Start with 3 sets of 5 – 10 repetitions.

BENEFITS

Great way for increasing the tone and size of the biceps without lifting heavy weights.

2 **Supinated Biceps Curl:** From the standing position with the elbows extended, the forearm in a supinated or palms up position, hold on to a dumbbell. The elbows are then flexed bringing the palm closer to the chest.

Can also be done with a weighted barbell as well.

Bodyweight – Triceps

Primary Muscles
Biceps
Secondary Muscles
Core Biceps Shoulders Forearms

1 **Dips:** The starting position is with the arms fully extended and flexion in the knees so that the butt is elevated off of the floor. Bend the elbows until the butt touches the ground and then fully extend the elbows.

Modification

Dips can also be completed on a chair, dip stand, parallel bars, or using gymnastics rings. These would accordingly increase the difficulty of the exercise by requiring more accessory muscle activation for improved stability.

KEY POINTS

Do 3 sets with 5 – 15 repetitions.

Avoid flexing the elbow greater than 90 degrees to prevent excess force on the shoulder.

BENEFITS

Great way for increasing the tone and size of the triceps without lifting heavy weights.

2 **Single Leg Dips:** The starting and ending position is the same as regular dips with the exception that one leg is extended during the entire movement.

This variation requires more core stabilization and also activates the quadriceps and hip flexor muscles.

3 **Single Leg Dips with Alternate Arm Reach:** When going from the ending position with the elbows flexed back to the starting position with the elbows fully extended, use the opposite arm and hand of the leg that his extended to reach for the foot.

4 **Dip with a Push Press:** When going from the ending position with the elbows flexed back to the starting position with the elbows fully extended, push up with all of your force to elevate the arms completely off of the ground.

This variation requires significant strength and stability. Only attempt if other variations have been mastered.

Bodyweight – Triceps

Primary Muscles
Biceps
Secondary Muscles
Core Biceps Shoulders Forearms

1 **Box Dips:** The starting and ending position is the same as regular dips with the exception that you are elevated on a box or a bench.

This variation can help less mobile individuals get a larger range of motion.

KEY POINTS

Do 3 sets with 15 – 20 controlled repetitions.

Avoid flexing the elbow greater than 90 degrees to prevent excess force on the shoulder.

BENEFITS

Great way for increasing the tone and size of the triceps without lifting heavy weights.

2 **Banded Triceps Kickbacks:** The starting position is with the band in the opposite hand or firmly fixed to a pole (not shown). The hand is then extended in a controlled fashion against the resistance of the band.

Weighted – Triceps

Primary Muscles
Biceps
Secondary Muscles
Core Biceps Shoulders Forearms

KEY POINTS

Do 3 sets with 8 – 12 repetitions.

Avoid going too heavy and not being able to pause at full extension.

BENEFITS

Great way for increasing the tone and size of the triceps.

1. **Dumbbell Triceps Kickbacks:** The starting position is with the arm flexed to approximately 90 degrees and the back parallel to the bench. Extend the elbow in a controlled fashion and hold the extension for a one count. This is similar to the banded triceps extension.

2 **Dumbbell Skull Crushers:** Start with your back on a bench. Fully extend the arms with dumbbells in each hand. Pick a weight you can do 8-12 reps controlled.

Bodyweight – Shoulders

Primary Muscles
Shoulders
Secondary Muscles
Upper Back Core Legs Triceps Biceps

1. **Shoulder Raise:** Starting from a high plank position, extend one arm in front of you until parallel to the ground or approximately 90 degrees. Next return the arm back down to the starting position and then repeat with the opposite arm.

KEY POINTS

Do 3 sets with 5 – 15 repetitions.

Consider not doing exercises number 2 and 3 if you have shoulder issues.

BENEFITS

The shoulders are commonly overlooked when working out the upper body and are key for arm stability.

2

Shoulder Push-Ups: From a high plank position extend the butt by flexing at the hips which will get you to the starting position. From here then flex the elbows so that the head touches the ground and then extend the elbows to return to the starting position.

3

Hand Stand Push-Up: While leaning on a wall, bring the body into a vertical position. Next, flex the elbows to 90 degrees and then extend the elbows until fully extended to return to the starting position.

This exercise requires significant upper body and core strength. Do not attempt if you have balance difficulties, back, or shoulder issues.

Bodyweight – Shoulders

Primary Muscles
Shoulders
Secondary Muscles
Upper Back
Core
Legs
Triceps
Biceps

1 **Front Shoulder Raise:** Start from a standing position. Dumbbells are placed in each hand. The arm is raised in a controlled fashion parallel to the ground. Next return the arm back down to the starting position and then repeat with the opposite arm.

KEY POINTS

Do 3 sets with 5 – 15 repetitions.

Control the descent of these exercises.

BENEFITS

The shoulders are commonly overlooked when working out the upper body and are key for arm stability.

Done as a complex altogether this can be an excellent shoulder burn!

2

Lateral Shoulder Raise: Start from a seated or standing position. Dumbbells are placed in each arm. The elbows are flexed to 90 degrees and then the shoulders are raised in a controlled fashion parallel to the ground.

3

Rear Shoulder Raise: Start from a seated or standing position with flexion at the waist (leaning forward). Dumbbells are placed in each arm. The elbows are flexed to 90 degrees and then the arm are raised in a controlled fashion parallel to the ground pausing briefly at the end range of motion.

Bodyweight – Shoulders

Primary Muscles
Shoulders
Secondary Muscles
Upper Back
Core
Legs
Triceps
Biceps

1. **Shoulder Press:** Start from a standing or seated position. Dumbbells are placed in each hand. The dumbbell is raised in a controlled fashion to directly overhead. Next return the arm back down to the starting position and then repeat with the opposite arm. Can be done simultaneously or single arm. When doing as a single arm this will use more contralateral core strength.

KEY POINTS

Do 3 sets with 8 – 12 repetitions.

Control the descent of these exercises.

BENEFITS

The shoulders are commonly overlooked when working out the upper body and are key for arm stability.

Modification

Arnold Shoulder press (on the next page) is an advanced movement that has the athlete utilize more shoulder muscles.

Bodyweight – Legs (Primary)

Primary Muscles
Gluteus Maximus Gluteus Medius
Secondary Muscles
Core Quadriceps Hamstrings

KEY POINTS

Do 3 sets with 8– 12 repetitions.

Control the descent of these exercises.

BENEFITS

Strengthening the legs is vital for hip, knee, and ankle health.

1. **Dumbbell Front Rack Hold Squats to a box:** Starting from a standing position with dumbbells in each hand, push your buttocks back as if you are reaching for the box. The box should be at a height that allows you to bend the knee to a 90 degree angle.

   Once the buttocks touches the box explode back up to the starting position.

   Make sure the knees stay behind the toes while squatting to prevent stress behind the knee cap and pain.

2 **Dumbbell Front Rack Hold Squats:** Starting from a standing position hold the dumbbells in the front rack position, then push your buttocks back as if you are sitting into a chair. Stop your descent when you are approximately parallel to the ground.

Once in the bottom position, quickly return to standing position. Controlling the descent or slowing the descent is known as eccentric lowering and can be helpful for athletes with knee, hip, or ankle pain.

Make sure the knees stay behind the toes while squatting to prevent stress behind the knee cap and pain.

Weighted – Legs (Primary)

Primary Muscles
Gluteus Maximus Gluteus Medius
Secondary Muscles
Core Quadriceps Hamstrings

1. **Barbell Front Squats:** Start from a standing position with the barbell in each hand and resting on your chest.

   Push your buttocks back as if you are reaching for an imaginary box keeping the core activated.

   Once the buttocks reaches approximately parallel to the floor you should explode back up to the starting position.

   Make sure the knees stay behind the toes while squatting to prevent stress behind the knee cap and pain.

KEY POINTS

Do 3 sets with 8– 12 repetitions.

Control the descent of these exercises.

The last two reps should be difficult. If they are not add additional weight.

BENEFITS

Front Squat vs. Back Squat changes the center of gravity of the weight for different emphasis.

2 **Barbell Back Squats:** Start from a standing position. You will hold the barbell in the back rack position, with the barbell resting on the top of your back.

You will then push the buttocks back as if you are reaching for the box, now without the box present the you stop your descent when your thighs are approximately parallel to the ground.

Once you are at the bottom position you quickly return to standing position. Controlling the descent or slowing the descent is known as eccentric lowering and can be helpful for athletes with knee, hip, or ankle pain.

Make sure the knees stay behind the toes while squatting to prevent stress behind the knee cap and pain.

Weighted – Legs (Primary)

1. **Barbell Deadlifts:** Start with your feet shoulder width apart. Hands can be a overhand grip or alternating grip. Shoulders should be pulled back with tension in the barbell and the core is tight and the back is straight. Drive through the heels as you keep a flat back with an engaged core. Pull the bar all the way up until the hips are completely extended.

   Keep the eyes focused approximately six feet in front of the feet. This ensures that the neck doesn't extend, which can lead to the lumber spine replicating that extension which can cause low back pain.

Primary Muscles
Gluteus Maximus Gluteus Medius
Secondary Muscles
Core Quadriceps Hamstrings Back

KEY POINTS

Do 3 sets with 8– 12 repetitions.

Control the descent of these exercises.

The last two reps should be difficult. If they are not add additional weight.

Avoid rounding the back to prevent injury.

BENEFITS

Excellent for building core and leg strength.

Weighted – Legs (Accessory)

Primary Muscles
Gluteus Maximus Gluteus Medius
Secondary Muscles
Core Quadriceps Hamstrings

KEY POINTS

Do 3 sets with 8– 12 repetitions on each leg.

Control the descent of these exercises.

The last two reps should be difficult. If they are not add additional weight.

1. **Dumbbell Farmer Carry Bulgarian Split Squat:** Start from a standing position with dumbbells in each hand hanging at the side and one foot elevated.

   Lower your body down until the quadriceps is approximately parallel with the ground. Once you reach the bottom position, quickly return to the starting position.

   Make sure the knees stay behind the toes while squatting to prevent stress behind the knee cap and pain.

BENEFITS

Strengthening individual legs is vital for athletes who spend most of the time making athletic moves.

2 **Dumbbell Front Rack Carry Bulgarian Split Squat:** Start from a standing position with dumbbells in each hand and placed on the shoulder with one foot elevated.

Lower your body down until his quadriceps is approximately parallel with the ground. Once you reach the bottom position, quickly return to the starting position.

Note: Changing the position of the dumbbell changes the center of gravity, which changes the focal point of the exercise.

Make sure the knees stay behind the toes while squatting to prevent stress behind the knee cap and pain.

Weighted – Legs (Accessory)

Primary Muscles
Gluteus Maximus Gluteus Medius
Secondary Muscles
Core Quadriceps Hamstrings

1 **Dumbbell Farmer Carry Lunge:** Start from a standing position with a dumbbell in each hand hanging at the side.

Step forward with your left or right foot to lower your body down until your quadriceps is approximately parallel with the ground and/or your knee touches the ground.

Once you reach the bottom position, quickly return to the starting position.

Make sure the knees stay behind the toes while squatting to prevent stress behind the knee cap and pain.

KEY POINTS

Do 3 sets with 8– 12 repetitions on each leg.

Control the descent of these exercises.

The last two reps should be difficult. If they are not add additional weight.

BENEFITS

Strengthening individual legs is vital for athletes who spend most of the time making athletic moves.

2 **Dumbbell Front Rack Carry Lateral Lunge:** Start from a standing position with the feet shoulder width apart and a dumbbell in each hand and placed in the front rack position.

Step with your left or right foot to lower your body down until the end range of motion is reached. Once you reach the bottom position, you should quickly return to the starting position.

Make sure the knees stay behind the toes while squatting to prevent stress behind the knee cap and pain.

Weighted/Resisted – Legs (Accessory)

Primary Muscles
Gluteus Maximus Gluteus Medius
Secondary Muscles
Core Quadriceps Hamstrings

1. **Dumbbell Hip Thrusters:** Start by lying down on your back with a barbell or dumbbells across the waist.

   Use your glutes to thrust the hips upward, while resting on your shoulder blades.

   Make sure to get the hips as extended as possible for maximum affect.

KEY POINTS

Do 3 sets with 8– 12 repetitions on each leg.

Control the descent of these exercises.

The last two reps should be difficult. If they are not add additional weight.

BENEFITS

Both of these exercises should be done if you deal with knee pain.

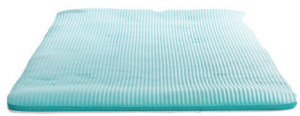
2 **Banded Clamshells:** Start by lying on one side with a light band around your knees and your knees flexed to 90 degrees with your hips flexed to 45 degrees.

While your feet remain in contact, open your knees only as far apart as you can.

Hold at the ending position for more emphasis on the glutes.

Plyometrics 100

Complete exercises 1 to 10 for 1 min each. Work-out time = 10 min



Primary Muscles
All Muscles

KEY POINTS

Plyometrics are great exercises for building strength, explosive power, and stability.

1. **Plyometric Push-up:** From a low or ending push-up position with the elbows bent to 90 degrees and the hands and feet shoulder width apart, push the body against the ground with maximum force to elevate the body off of the ground.

   Land softly in the starting position on a rubber mat to prevent wrist injury.

   When the body is in the air you can clap the hands together as well.

Primary Muscles
Gluteus Maximus Gluteus Medius
Secondary Muscles
Core Quadriceps Hamstrings

KEY POINTS

Stability, proper form, and warming up is extremely important to prevent falls and injuries while doing plyometrics.

BENEFITS

Plyometrics are great exercises for building strength, explosive power, and stability.

2 **Box Jumps:** The starting position is in a squat position and then an explosive jump is performed to a vertical jump and the feet land flat on a box or stable flat surface. Once your balance is achieved at the top of the box then step backwards onto the ground one foot at a time.

Plyometrics 100

Complete exercises 1 to 10 for 1 min each. Work-out time = 10 min

Primary Muscles
Legs
Secondary Muscles
Core

3 **Tuck Jumps:** In the standing position with the feet shoulder width apart proceed to do a vertical jump with flexing the knees 90 degrees into the chest.

Land softly onto the balls of the feet to prevent injury.

4 **180 Degree Ground Jumps:** Start with the hands and feet on the ground and the hips flexed so that butt is slightly in the air. Without moving the hands, jump as high up as you can while also twisting the body to the right side. Once landing on the ground, then repeat the movement jumping as far over to the left side as possible.

Land softly onto the balls of the feet to prevent injury.

Primary Muscles
Legs
Secondary Muscles
Core Shoulders Forearms

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Plyometrics are great exercises for building strength, explosive power, and stability.

Plyometrics 100 Complete exercises 1 to 10 for 1 min each. Work-out time = 10 min

5 **Squat Jump:** From the full squat position explode into a vertical jump into the air as high as you can. Return to the squat position and repeat.

Ensure that you maintain a proper squat position throughout the exercise to prevent knee injury. Always keep the knees behind the toes!

6 **Skaters:** The starting position is from a quarter single leg squat launch to the opposite leg landing in the starting position on the opposite leg.

Do not attempt this exercise if there are existing stability or balance issues.

Primary Muscles
Legs
Secondary Muscles
Core

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Plyometrics are great exercises for building strength, explosive power, and stability.

Plyometrics 100

Complete exercises 1 to 10 for 1 min each. Work-out time = 10 min

Primary Muscles
Legs
Secondary Muscles
Core

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Plyometrics are great exercises for building strength, explosive power, and stability.

7 **Single Leg Hop:** Start in a squat position and then jump up on one leg as high as you can. Land on the starting leg softly by rolling through the toes.

8 **Long Jump:** Start in the squat position and jump forward as high and far as you can.

Roll through the toes as you land softly.

9 **Single Leg Long Jump:** Start in the squat position and jump forward as high and far as you can while also extending one leg in front of you. Land on the leading leg and the non-leading leg will land next.

Roll through the toes as you land softly.

Plyometrics 100

Complete exercises 1 to 10 for 1 min each. Work-out time = 10 min

10 **Burpee:** From the standing position with the feet shoulder width apart proceed to do a vertical jump. Next transition into a low squat position with the palms touching the floor. From this position, extend the legs back while lowering the chest to the floor. Finally, push the body up from the floor and go back into the low squat position with the palms on the floor then going directly into a vertical jump.

Land softly in the starting position on a rubber mat to prevent wrist injury.

When the body is in the air you can clap the hands together as well.

Primary Muscles
All Muscules

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Plyometrics are great exercises for building strength, explosive power, and stability.

Modifications:

For a more difficult variation, use only one arm when transitioning into the squat into a 1 arm plank.

For an easier variation, from the squat position, only go into a plank position without doing a push-up.

Insane 500

Complete 50 repetitions of each of the following exercises with a 45lb (men)/35lb (women) barbell or 20 pound dumbells in each hand.

1 Hip Thrusters

KEY POINTS

The proper techniques for executing all of these exercises have been previously described in this book.

Track your progress!

BENEFITS

Excellent workout for toning and building muscle mass.

2 **Shoulder Press**

3 **Front Squat**

Insane 500

Complete 50 repetitions of each of the following exercises with a 45lb (men)/35lb (women) barbell or 20 pound dumbells in each hand.

Primary Muscles
Latissimus Dorsi Upper Back

KEY POINTS

The proper techniques for executing all of these exercises have been previously described in this book.

Track your progress!

BENEFITS

Excellent workout for toning and building muscle mass.

4 **Standing Row:** Start with a barbell in a bent over position. (Shown at the right with dumbbells)

Bring the barbell to your chest/mid stomach. Lower the barbell down and repeat.

5 **Biceps Curl**

6 **Forward Lunge**

7 **Front Shoulder Raise**

Insane 500

Complete 50 repetitions of each of the following exercises with a 45lb (men)/35lb (women) barbell or 20 pound dumbells in each hand.

8 **Triceps Skull Crushers**

9 **Chest Bench Press**

Primary Muscles
Legs
Secondary Muscles
Core

KEY POINTS

The proper techniques for executing all of these exercises have been previously described in this book.

Track your progress!

BENEFITS

Excellent workout for toning and building muscle mass.

10 **Barbell Hops:** Start from a standing position. A barbell is placed on the upper back.

You then jump up and down 1 – 2 inches off of the ground in a controlled fashion (not shown).

HIIT Upper Body and Core – Bodyweight

Complete as many repetitions of each exercise in 1 minute with a 20 second break before going to the next exercise.

1 **Push-up (100 reps}**

2 **Air Squats (100 reps)**

3 **Dips (100 reps)**

4 **Dips (100 reps)**

KEY POINTS

The proper techniques for executing all of these exercises have been previously described in this book.

Track your progress!

BENEFITS

Great way to tone the upper body and strengthen the core in less than 15 minutes!

5 **Shoulder Push-up**

6 **Superman**

HIIT Upper Body and Core – Bodyweight

Complete as many repetitions of each exercise in 1 minute with a 20 second break before going to the next exercise.

7 **Supinated Biceps Curl**

8 **Medicine Ball Twist**

9 **Towel Fly**

10 **Ab Wheel**

KEY POINTS

The proper techniques for executing all of these exercises have been previously described in this book.

Track your progress!

BENEFITS

Great way to tone the upper body and strengthen the core in less than 15 minutes!

HIIT Upper Body and Core – Weighted

Complete as many repetitions of each exercise in 1 minute with a 20 second break before going to the next exercise.

1 **Dumbbell Bench-press**

2 **Dumbbell Hip Thrusters**

3 **Dumbbell Triceps Kickback**

4 **Knee to Elbow Plank**

5 **Front Shoulder Raise**

KEY POINTS

The proper techniques for executing all of these exercises have been previously described in this book.

Track your progress!

BENEFITS

Great way to tone the upper body and strengthen the core in less than 15 minutes!

HIIT Upper Body and Core – Weighted

Complete as many repetitions of each exercise in 1 minute with a 20 second break before going to the next exercise.

6 **Single Leg Raise**

7 **Dumbbell Hip Thrusters**

KEY POINTS

The proper techniques for executing all of these exercises have been previously described in this book.

Track your progress!

BENEFITS

Great way to tone the upper body and strengthen the core in less than 15 minutes!

8 **Shoulder Press**

9 **Crossed Scissor Abs**

HIIT Lower Body and Core

Complete as many repetitions of each exercise in 1 minute with a 20 second break before going to the next exercise.

1 **Barbell Squat**

2 **Low Plank Oblique Crunch**

3 **Ab Wheel**

KEY POINTS

The proper techniques for executing all of these exercises have been previously described in this book.

Track your progress!

BENEFITS

Great way to tone the upper body and strengthen the core in less than 15 minutes!

4 **Dumbbell Lunge**

5 **Dumbbell Lateral Squat**

HIIT Lower Body and Core

Complete as many repetitions of each exercise in 1 minute with a 20 second break before going to the next exercise.

6 Superman Pulse

8 Scissor Abs

7 Dumbbell Squat

KEY POINTS

The proper techniques for executing all of these exercises have been previously described in this book.

Track your progress!

BENEFITS

Great way to tone the upper body and strengthen the core in less than 15 minutes!

9 **Barbell Deadlift**

10 **In and Out Abs**

Pregnant & Fit

Complete exercises 1 to 10 for 1 min each at your own pace.

Primary Muscles
All Muscles

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Safety is key! Always be mindful of balance and stability when doing each exercise.

Stay hydrated!

1 **Toe Touch (Warm-Up):** From the standing position, bend forward and twist the left shoulder and hand to touch the right foot. Return back to the standing position and then complete the motion on the opposite side.

Try and keep the back straight and the core engaged.

Modifications:

If unable to fully bend forward to touch your foot, then stop at the knee.

2 **Lateral Lunge:** From a standing position extend one leg coming to a squat position with paying key attention to proper squat technique with not extending the knee beyond the toes. Switch to the opposite side.

3 **Incline Push-ups:** Rest your hands on the edge of a stable surface and then proceed to do a push-up in this position. This variation tends to work the upper portion of the chest muscles. The steeper the incline the easier this becomes.

Ensure that the feet are stable to prevent slipping.

Pregnant & Fit

Complete exercises 1 to 10 for 1 min each at your own pace.

Primary Muscles
All Muscles

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Safety is key! Always be mindful of balance and stability when doing each exercise.

Stay hydrated!

4 **Front Raises:** With a light dumbbell in the hands, the palms facing down, and the hands shoulder width apart raise one arm at a time or both arms simultaneously to eye level or slightly above.

Modifications:

This can also be done without weights and adding more repetitions as well.

5 **Squat:** From a standing position with the feet shoulder width apart, with the back straight, sit back into a squat position as if you were sitting on a chair. Return to the standing position.

Keep the knees behind the toes during the movement to prevent extra stress to the knees.

For increased stability you can extend the arms during the movement.

6 **Shoulder Press:** From the standing position, raise the arms to 90 degrees with the elbows bent and then straighten the arms directly over your head. Return to the starting position and repeat.

Modifications:

For a more difficult variation, try this exercise with a squat added.

Pregnant & Fit

Complete exercises 1 to 10 for 1 min each at your own pace.

7 **Biceps Curls:** From the standing position with the arms shoulder width apart, holding a light dumbbell in your hands, and the palms facing upwards bring the hands towards the chest while bending the arm at the elbow.

8 **Plank:** With the arms fully extended and shoulder width apart and the ankles together, there should be a straight line from the shoulders down to the feet. Once fatigued, bring the knees to the ground for a brief second and then restart the exercise.

Avoid dipping in the hips or elevating the butt once the core starts to fatigue.

Modifications:

This can also be done on the forearms to decrease stress on the shoulders and wrists.

Primary Muscles
All Muscles

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Safety is key! Always be mindful of balance and stability when doing each exercise.

Stay hydrated!

9 **Triceps Extension:** From the standing position with the feet shoulder width apart and holding a light dumbbell with one arm extended over the head and the elbow bent to 90 degrees, fully extend the arm by straightening out the elbow. You can use the opposite hand to stabilize the elbow while performing the movement.

Modifications:

If you have shoulder issues, then a variation is doing this while leaning forward in a lunge position with the elbow bent at 90 degrees and then extending the arm straight back to fully extend the arm.

10 **Side Plank:** While lying on your side, extend the hip off of the ground. Once fatigued, lower the hip back to the ground and then restart.

Avoid dipping at the waist, the body should form a line from this position!

Pregnant & Fit

Complete exercises 1 to 10 for 1 min each at your own pace.

Primary Muscles

All Muscles

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Safety is key! Always be mindful of balance and stability when doing each exercise.

Stay hydrated!

11 **Hip Flexor Stretch:** With the feet in a wide stance apart from front to back, lean forward at the waist with the hands on the hips. Hold for 30 seconds and then switch to the opposite side.

For a deeper stretch, fully flex at the waist bringing the chest down to the knee. And touch the palms on the ground.

To open and stretch the chest, stabilize one arm on the ground and then rotate the opposite palm toward the sky with the arm fully extended. Return both palms back to the ground and then repeat on the opposite side.

12 **Lower Back Stretch:** From the squat position with the elbows resting on the knees, fully flatten the back and then fully arch the back. Repeat.

13 **Triceps Stretch:** From the standing position with the feet shoulder width apart, both arms raised and elbows flexed. With your right hand grab your left elbow and slowly pull down and hold for 30 seconds and then switch to the opposite side.

Pregnant & Fit

Complete exercises 1 to 10 for 1 min each at your own pace.

14 **Gluteal Stretch:** From a position of lying on your back and both knees flexed, place the left foot on the front of the right thigh and hold for 30 seconds.
Return to the starting position and then switch to the opposite leg.

Modifications:

To increase the stretch intensity, slowly raise the foot planted on the ground up to increase the stretch to the opposite gluteal muscles.

This stretch can also be completed standing to prevent having to lie on your back if further along in your pregnancy.

Primary Muscles
All Muscles

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Safety is key! Always be mindful of balance and stability when doing each exercise.

Stay hydrated!

15 **Upper Back Stretch:** From the standing position with the feet shoulder width apart, cross the left arm completely across the chest and then take the right arm and pull the left arm even closer to the chest and hold in this position for 30 seconds. Return to the starting position and repeat on the opposite side.

16 **Chest and Biceps Stretch:** From the standing position with the feet shoulder width apart, extend both arms fully behind the waist and interlock the fingers. Hold for 1 minute.

17 **Quadriceps Stretch:** From the standing position with both feet shoulder width apart, bend the right knee and then with the right hand grab the right ankle and pull the foot towards the butt. Hold here for 30 seconds and then switch to the opposite side.

For improved stability, elevate the opposite arm.

Yoga 101

Movements to help with mobility and stability– Perform each pose as needed. Usually holding for 4-7 breathes.

Primary Muscles

All Muscles

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Safety is key! Always be mindful of balance and stability when doing each exercise.

Stay hydrated!

1. **Downward Dog:** one of the foundational poses in yoga. This pose does wonders for ankles, hamstrings, hips, and shoulders. Emphasis should be put on the body only bending at the hips and keeping the upper and lower body as straight as possible.

   (Shown above)

2. **Boat:** This pose places emphasis on the a bdominal core muscles. In this pose you will sit supine and break at your hips as shown above.

   (Shown above)

3 **Crescent Lunge:** Lunge forward on your front leg. Extend your arms overhead and bend your back leg. Hold this pose for 4-7 breaths and to really focus on overhead mobility and single leg stance stability. (Shown above)

4 **Warrior 2:** This pose places emphasis on the quadriceps in the front leg and mobility in all of the shoulder and hips. You are opening the hips and the chest. Hold this pose for 4-7 breaths. (Shown above)

Yoga 101

Movements to help with mobility and stability– Perform each pose as needed. Usually holding for 4-7 breathes.

Primary Muscles

All Muscles

5 **Sleeping Pigeon:** This is a great hip opener. The hip is internally rotated and the lower leg is parallel to the while the body is upper torso is flexed over the leg. (Shown above)

6 **Full Pigeon:** The hip is internally rotated and the foot is brought to parallel with the front of the mat. The back is extended. Hold this for 4-7 breaths. (Shown above)

KEY POINTS

Keep the core engaged during the entire motion.

BENEFITS

Safety is key! Always be mindful of balance and stability when doing each exercise.

Stay hydrated!

7 **Twisted Chair:** Sit into a half squat. Press the hands together and twist to one side. Hold this pose for 4-7 breaths to open up the thoracic spine. (Shown above)

8 **Tree Pose:** The focus is on single leg balance. You are instructed to balance on one leg with your other leg in a tripod position.

If your mobility is limited, you can put the foot on the opposite ankle. This pose can help with your awareness in space. (Shown above)

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