# FITT

**Topics include:**

- Components of fitness
- Frequency
- Intensity
- Time
- Type

Overall health is affected by each component of fitness (Garber et al, 2011). As fitness professionals, we may focus on one aspect, or mostly on one aspect. For example, maybe you are strength and conditioning coach, so your work revolves around athletes becoming stronger and faster, or maybe you are a yoga instructor who helps people with coordination and proprioception, or you are a running coach who trains individuals to run 26.2 miles. Regardless, some of this may, and should seem remedial, but it is worth reviewing to gain a deeper understanding, or simply as a reminder, of how it all connects.

The components of fitness are:

- Cardiorespiratory/Aerobic
- Muscular fitness
- Flexibility
- Neuromuscular fitness/Mind-body exercise
- Body composition (discussed in depth in Chapters 10 & 11)

**Aerobic Exercise**

Each type of exercise provides beneficial chronic adaptations. Aerobic exercise is continuous, rhythmic, uses large muscle groups, and is used to develop cardiorespiratory capacity (American College of Sports Medicine [ACSM], 2018). Cardiorespiratory fitness refers to the capacity of the cardiorespiratory system to provide muscles with oxygen during exercise (Lin et al., 2015). Increased cardiorespiratory capacity allows the body to perform for a longer duration at a higher intensity without fatigue; which allow activities of daily living to be performed more easily (ACSM, 2018; Heath, 2013). ACSM (2018) has developed an aerobic exercise continuum (Table 6.1), consisting of four categories, based on current capacity, derived from an assessment, and desired outcome.

Table 6.1

*Aerobic exercise continuum*

| Level | Intensity | Examples |
|---|---|---|
| 1 | For deconditioned clients, requires minimal skill | Walking and aquatic exercise |
| 2 | Vigorous intensity exercise for currently active clients; requires minimal skill | Jogging/running, rowing, elliptical, and spinning |
| 3 | For moderately fit and skilled clients | Cross country skiing, skating, and swimming |
| 4 | Indicates a client can participate in recreational sports | Racquet sports, downhill skiing, or vigorous hiking |

Chronic adaptations to aerobic exercise include increased cardiac output and stroke volume, reduced heart rate, and increased capillarization. Neural adaptions begin immediately and increase as a client progresses into skilled activity. Muscular endurance and power will increase in direct proportion to exercise intensity, as will bone growth, and tendon and ligament strength; the more intense the exercise, the greater the growth and strengthening (Swank, 2008). Similarly, there appears to be a dose-response relationship favoring the acute and chronic benefits of aerobic exercise on cardiometabolic risk factors, indicating regular exercise, as proposed in the frequency, intensity, time, and type (FITT) guidelines (Table 6.3), results in a long-term positive effect. Also, there is evidence suggesting cardiovascular disease (CVD) risk factors are mediated at capacities starting at one-half the recommended volume, and cardiorespiratory fitness may be a better predictor of CVD mortality and morbidity than smoking, hypertension, and diabetes (Garber et al., 2011; Kamil-Rosenberg & Garber, 2016).

**Muscular Fitness**

Muscular fitness refers to strength, power, and endurance.

- Muscular strength is the ability to exert force at a certain speed; force = mass x acceleration.
- Muscular power is the ability to exert force rapidly; power = force x velocity.

- Muscular endurance is the ability to perform repeated muscular contractions over time.

Although the dose-response relationship between muscular fitness and health outcomes is still under investigation, associated benefits of muscular fitness are increased functional capacity and neuromuscular control; improved cardiometabolic risk factor profiles, such as insulin resistance and blood pressure; a lower risk of CVD events and all-cause mortality; and a lower risk for nonfatal diseases (Garber et al., 2011; Heath, 2013). Additionally, there is an increase in enzyme activity, metabolic energy stores, connective tissue strength, and a decrease in body fat percentage (Ratamess, 2008). Weight bearing exercise has also been associated with increased bone mineral density, reduced incidence of osteoarthritis, improved energy levels, and reduced depression and anxiety. There are four commonly used types of resistance training (ACSM, 2018):

- Dynamic constant external resistance (DCER) refers to training in which a weight being lifted does not change. The original term, *isotonic* (same tension), is not an accurate description as the tension changes as muscle fibers lengthen, and joint length and angle vary throughout the range of motion (ROM). Free-weights, dumbbells, bodyweight, and some machines are examples of DCER.
- Due to the inconsistent tension in DCER, machines with cams and lever arms that ensure consistent tension throughout the ROM have been developed. These variable resistance machines change the resistant force to overcome the deficits in DCER by matching the strength curve. Accommodated resistance is a form of variable resistance training that uses bands and chains, in conjunction with free weighs, dumbbells, or body weight, to provide less resistance at the weakest part of the lift, and greater resistance as the lift continues through the ROM.

- Isokinetic (same speed) uses specially designed machines to keep the rate of the movement constant by changing the amount of resistance throughout the ROM. Isokinetic machines are mostly used in physical therapy and rehabilitation settings. However, by allowing an increase of movement speed, sports that require high velocity can also benefit from isokinetic training.
- Plyometric training improves neuromuscular performance by rapidly stretching a muscle (eccentric), immediately followed by rapidly shortening the muscle (concentric). Jumping, hopping, and medicine ball and rope slams are examples of plyometric training.

Table 6.3 details FITT guidelines for resistance training.

**Flexibility**

Flexibility refers to the range of motion (ROM) of a joint or body segment. ROM can be determined by the type of joint, properties of muscles, ligaments, and tendons interacting with a joint, level of activity, age, and gender (ACSM, 2018; Jeffreys, 2008). Proper ROM can help reduce injuries and increase physical performance. Conversely, limited ROM, or short, tight muscles will not contract or relax efficiently, altering the length-tension and force-couple relationships, resulting in a decrease of strength and adequate circulation. More importantly, the altered muscular relationships will decrease mobility resulting in poor posture, limited functional capacity, and impair activities of daily living (ADLs). Table 6.2 details the average ROM for heathy adults.

Table 6.2

*Average range of motion for healthy adults*

| Joint and movement | Range of motion | Joint and movement | Range of motion | Joint and movement | Range of motion |
|---|---|---|---|---|---|
| Hip | | Shoulder/Scapulae | | Cervical spine | |
| Flexion | 100-120 | Flexion | 150-180 | Flexion | 45-50 |

| | | | | | |
|---|---|---|---|---|---|
| Extension | 10-30 | Extension | 50-60 | Extension | 45-75 |
| Abduction | 40-45 | Abduction | 180 | Lateral flexion | 45 |
| Adduction | 20-30 | Internal rotation | 70-80 | Rotation | 65-75 |
| Internal rotation | 35-45 | External rotation | 90 | Thoracic Spine | |
| External rotation | 45-60 | Horizontal adduction | 90 | Flexion | 30-40 |
| Knee | | Horizontal Abduction | 30-40 | Extension | 20-30 |
| Flexion | 125-145 | Elbow | | Lateral flexion | 120-25 |
| Extension | 0-10 | Flexion | 145 | Rotation | 35 |
| Ankle | | Extension | 0 | Lumbar Spine | |
| Dorsiflexion | 20 | Radio-ulnar | | Flexion | 40-45 |
| Plantarflexion | 45-50 | Pronation | 90 | Extension | 30-40 |
| Subtalar | | Supination | 90 | Lateral flexion | 20 |
| Inversion | 30-35 | Wrist | | Rotation | 10-15 |
| Eversion | 15-20 | Flexion | 80 | | |
| | | Extension | 70 | | |
| | | Radial deviation | 20 | | |
| | | Ulnar deviation | 45 | | |

Comana & McGrath, 2015; Soucie et al., 2011

There are a number of modes of flexibility (ACSM, 2018; Behm, Blazevich, Kay, & McHugh, 2016; Bushman, 2016; Jeffreys, 2008; Keteyian, 2013):

- Static stretching (SS) is often referred to as *stretch and hold* and may be the most common stretching due to the ease of implementation. SS involves lengthening a muscle until the point of discomfort, and then holding the position for a prescribed time; usually 20-30 seconds, but often up to 60 seconds for deconditioned adults. Although SS has been demonstrated to decrease muscle and joint stiffness, and increase ROM, there is some evidence, because of the slow and controlled nature, it may hinder sports performance when performed prior to an event.
- Active and passive stretching are similar to SS in that a muscle is lengthened and then held. However active stretching uses an antagonist muscle or muscle group to hold the stretch, and passive stretching uses an aid such as a yoga band or a partner to assist.
- Dynamic stretching (DS) increases ROM by slowly and repeatedly moving through a specific movement or pattern around an active joint or body segment. DS has become increasingly popular prior to activity and athletic events as it increases core

temperature, muscle compliance, and nerve conduction. Additionally, the design of DS movements is limited only by imagination and mechanical dysfunction.

- Proprioceptive Neuromuscular Facilitation (PNF) stretching, is also known as *contract and relax stretching*. It is performed by contracting a muscle, using isometrics or against a resistant force, followed by SS. Through the reciprocal inhibition response of the Golgi tendon organs, a muscle and tendons elongate to achieve a greater ROM than SS alone. It is not as popular as other forms of flexibility, as it is difficult to perform alone, and although popular with physical therapists due to the controlled nature, PNF is becoming more prominent in athletics.
- Ballistic stretching uses repetitive rapid or bobbing movements to quickly move a muscle into an elongated position, followed quickly by relaxation of the muscle. Ballistic stretching is often used as a pre-exercise warm-up and prior to athletic events. However, due to the fast nature of the movement, the stretch reflex is activated but the muscle does not have time to respond, creating an opportunity for injury to the muscle or connective tissue.

Table 6.3 details FITT recommendations for stretching and flexibility.

**Neuromuscular Fitness**

Neuromuscular fitness, also known as mind-body exercise, can in part, be defined as exercise that integrates the brain, mind, body, and behavior, and promotes flexibility, strength, and relaxation (Kenney & Alexander, 2015; Rudaz, Ledermann, & Witt, 2017). Neuromuscular exercise has been demonstrated to better manage CVD, diabetes, and hypertension (La Forge, 2009). Although any exercise can incorporate or increase the mind-body connection, yoga and Tai-chi are traditionally thought of as mind-body modalities, and more recently

Pilates (La Forge, 2015). To be considered as a form of neuromuscular fitness, the exercise should (La Forge, 2016):

- Be non-competitive and meditative.
- Include low- to moderate-level muscular activity that increases proprioceptive awareness.
- Include breath-centering techniques.
- Incorporate proper anatomical alignment in any static position or movement patterns.
- Be energy-centric and encourage awareness of the movement and flow.

Table 6.3 details FITT recommendations for neuromuscular exercise.

FITT guidelines need to be considered for the mode of exercise, each client, and the specific circumstances; all based on assessments. To achieve results, a minimum intensity threshold must be realized; therefore, the proposed guidelines are based on the overload principle of training to challenge physiological parameters. Table 6.3 details the current FITT recommendations.

Table 6.3

*FITT guidelines*

| Mode | Frequency | Intensity | Time | Type |
|---|---|---|---|---|
| Cardiorespiratory Exercise/Aerobic | ≥ 5 days/week of moderate intensity or ≥ 3 days/week of vigorous intensity | Moderate or vigorous | 30-60 min/day of moderate (150 min/week)<br>20-60 min/day of vigorous (75 min/week) | Continuous, rhythmic, includes all major muscle groups |
| Older or deconditioned individuals | | Light to moderate | bouts of <10 min can be beneficial | |
| Resistance Exercise | Each major muscle group 2-3 days/week | 60%–70% of the 1RM (moderate to hard intensity) for novice to intermediate exercisers<br>≥80% of the 1RM (hard to very hard intensity) for | 8–12 reps to improve strength<br>15–20 reps to improve muscular endurance<br>2-4 sets | Resistance exercises involving each major muscle group, targeting larger groups first |

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|---|---|---|---|---|
| | | experienced strength trainers<br><50% of the 1RM for muscular endurance | | |
| Older or deconditioned individuals | | Light intensity; 40-50% 1RM | 10–15 reps for strength<br>15-20 reps for muscular endurance<br>A single set can be effective | |
| Posture Restoration | 1-2x/day | Small overload in controlled positions | Hold isometric contractions for 5-10 seconds<br>Dynamic contractions: 1-2 sets, 12-20 reps | 30-45 minutes<br>1-3 months |
| Flexibility | ≥ 2-3 days/week | Stretch to the point of feeling tightness or slight discomfort | Static stretching hold for 10-30 sec. or up to 60 sec. for older individuals<br>For PNF stretching, a 3- to 6-sec contraction at 20%–75% maximum voluntary contraction followed by a 10-30 sec. assisted stretch | Static flexibility, Dynamic flexibility<br>PNF |
| Older or deconditioned individuals | | | Static stretching hold for up to 60 sec. | |
| Posture Restoration | 10 min bouts<br>1-2x/day | Static-to the point of tension<br>Dynamic-controlled to the point of resistance | Static- 2-4 reps; 30-60 seconds<br>Dynamic- 1-2 sets, 5-10 reps | 30-45 min<br>1-3 months |
| Neuromuscular exercise training<br>The effectiveness of neuromuscular exercise training in younger and middle-aged persons has not been Established | ≥2-3 days/week | N/A | ≥20-30 min/bout | Exercise that challenges motor skills, coordination, and proprioception such as Yoga or Tai Chi |

ACSM, 2018; Garber et al., 2011

## Discussion and application

1. Outline the components of FITT as they pertain to flexibility, cardiovascular exercise, and resistance training.

2. Define joint stability and joint mobility, and how will you explain the importance of each to a client?

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