Chapter 20

Functional Training Concepts

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Introduction
It is often felt that the average personal training client requires improvements in endurance, strength, power, balance, speed, and coordination, but for what purpose? Earlier text suggested that all of these components of fitness are necessary to reduce the risk of functional decline, which leads to loss of independence with age. If this is, in fact, the ultimate goal of physical activity, then it makes more sense to train people to enhance their performance in everyday activities and those they enjoy participating in for recreation than to train them as weight lifters or body builders. This logic questions the traditional methods of training used in the normal gym setting. Is there a way to train people to improve in the aforementioned components that works better than the standard prescribed method? In sports training for improved performance the activities mirror totally, or in part, the sport-specific actions performed on the field. Therefore, it stands to reason that if improved human performance or function is the goal, the training should resemble wholly, or in part, the activities that are performed by the client every day.

Defining Function
The term function is synonymous with purpose. So when function or “functionality” is applied to human movement, it suggests that the mechanical action of the body serves a specific purpose. Since normal body movements are proprioceptively integrated and multi-planar, the activities designed to make the body more functional should also meet the same description. Traditional resistance training employs movements that are isolated and often performed in a single plane of motion. These movements fail to duplicate the complex tasks that the body experiences during normal everyday activities. For instance, a person carrying a bag of groceries drops his or her house keys on the ground when attempting to unlock the front door of their house; the actions of holding the bag without spilling out the contents while bending and picking up the dropped keys cannot be modeled by a single plane resistance machine. Rather, the movement requires the neuromuscular system to account for concentric, eccentric, and isometric contractions with varying acceleration, deceleration, and stabilization (6). With the body constantly reacting to gravity, ground reaction forces, and momentum, it is important to realize that isolated or traditional resistance training does not effectively condition the central nervous system (CNS) to efficiently handle everyday movement patterns.

To accomplish better movement economy, activities should increase the requirements of the CNS, in conjunction with peripheral neural adjustments, to optimize neuromuscular control. Since a complex relationship exists between all segments of the musculoskeletal system and the central nervous system, the activities used in a functional training program should exploit the need for dynamic, multidimensional strength development (5). This new training paradigm, often called functional training, proposes the fundamental concept of training movements, instead of specific body parts. Functional training should enhance coordinated movements directed at a target activity. For this to be accomplished, the fitness professional must first understand what makes movement so complex.

~Quick Insight~

Proprioception
Proprioception is the unconscious perception of spatial orientation, movement, and muscular tension arising from stimuli within the body itself. The mind’s awareness of the orientation of the body in space and the direction, extent, and rate of movement of the limbs depend, in part, upon information derived from sensory receptors in the joints, tendons, and muscles. Information from these receptors, called proprioceptors, is normally integrated with signals arising from vestibular receptors in the inner ear (which signal gravitational acceleration and changes in velocity of movements of the head), as well as from visual, auditory, and tactile receptors. Sensory information from certain proprioceptors, particularly those in muscles and tendons, need not reach consciousness; however, it can be used by the motor system as feedback to guide postural adjustments and control of well-practiced or semiautomatic movements, such as those involved in walking. A simple example of how the proprioception system works is when you place your hand in front of your face with your eyes closed. Though you can not visually see your hand, you mind is aware of its position in front of your face. This awareness exists because sensory organs in your muscles and tendons send signals to your brain, indicating the position and movement of the arm. When learning complicated movements, such as swinging a golf club, your body uses feedback from proprioceptors to tell the brain the exact position and angular velocity of the limbs, as well as tension in muscles of the trunk and lower extremities to maintain adequate balance and coordinate the movement, even though one is visually focused on the golf ball. For the beginner, these movements may initially feel awkward. However, after repeated drilling, the feedback from the proprioceptors aids the body in reinforcing the neuromuscular signals that control muscular contraction so that the coordinated movements can be performed without thinking.
Motor learning, from a conventional approach, involves the concept of sequential phases of learning - cognitive, associative, and autonomous. The fully developed concept suggests that attention requirements needed to perform a task are progressively reduced as motor development increases. This model contrasts with the theory that skill learning is actually a process of recall and recognition, in which motor programs are learned and stored in the nervous system. This theory implies that sensory input from physical environments is recorded as movements are performed and is then used to duplicate the neuromuscular activity when a similar physical environment or condition is experienced (10). Repeated movement patterns combined with external neuromuscular stimulus reinforce duplicable physiological responses, which enhance movement efficiency.

This theoretical discussion simply suggests that when a person performs something routinely they become proficient at it. The more proficient they become, the less focus or attention to the task is necessary to perform it gracefully. A task that was once challenging when first attempted becomes “second nature” because it requires such little attention to perform. Essentially, the body has effectively “learned” the movement. A circus clown is not born with the ability to juggle, but after doing it for a number of years, he or she becomes so proficient that he or she can juggle with different objects and engage in different movements at the same time to entertain a crowd. He or she spends little focus on the act of juggling, even though it is a very difficult task for most people. The same proficiency can be attained at any reasonable physical task, as long as it is properly instructed and adequately practiced.

Traditional Training vs. Functional Training

Traditional strength training requires a certain muscle group to produce force and move repeatedly in a single plane – as seen in a standard bicep curl or bench press. Repetitive single plane movement, under the application of load increases the specific neuromuscular action of that particular movement, explaining why the bench press weight can be increased over a training cycle. However, this simple movement pattern only improves the efficiency of the muscles used for the specific task. If the goal of the training is to bench press high amounts of weight then the training is appropriate. But what benefit does this training provide if the goal is improved function in life activities? How often does one find the need to lie on the floor and press a weighted bar off one’s chest within an average day? The same question can be asked of an athlete: when are you going to need to duplicate a supine bench press in your sport? In most cases, when forward pressing occurs in sports, the load is applied asymmetrically; the body provides the stability, and the ground contact is maintained with varying stance positions. When forward pressing occurs in the average person’s day, it is usually to push something into the back of an SUV or to move things back on a shelf. In both cases, the person is standing on the ground with varying amounts of hip flexion and without the back support of a bench for stability.

Movement is a complex, interdependent series of events that involves synergists, neutralizers, stabilizers, agonists and antagonists. Therefore, the training program should reflect the need to incorporate the muscles used for each of these responsibilities (5). This suggests that, instead of isolating muscles and movements during traditional weight training, integrating coordinated movement patterns better teaches the CNS to orchestrate acceleration, deceleration, and stability to accomplish a real-life movement efficiently (8). By forcing synchronicity between the neuromuscular system and the musculoskeletal system, the movements become more fluid and provide greater economy when the body encounters similar situations during sports, activity, and everyday life. Cases in point, which machines do you use to train for bowling, water skiing, or doing the laundry?

Training for human function is a relatively new training paradigm that offers alternatives to machine-dominated resistance training, using the traditional training principles because functional training integrates the need for additional physiological support mechanisms (4, 9). The focus shifts from training a single muscle or muscle group to training movements designed to target a specific activity or desired outcome. For instance, the seated dumbbell press and box step-ups are used routinely in traditional programs for shoulder and leg strength. Both are in a single plane of movement. Applying the functional concept, multi-planar movements and increasing stability can be created by performing a lateral box step-up with a single arm overhead dumbbell press. Combining activities and loading the body asymmetrically addresses numerous factors that challenge the body in ways the use of the traditional methods cannot.

Employing functional based training allows the trainer to elicit physiological adaptations from varied environments and modified movements, as well as promotes an increased neural response from the activity. Ideally, the program activities are aimed at a carry-over response for enhanced performance and functionality in everyday activities. Performing a squat with a low to high medicine ball twist may produce a similar
movement to picking up a laundry basket full of clothes and placing it on the dryer. Step-ups with an asymmetrical and laterally held medicine ball duplicate carrying a child in one arm while going up the stairs. It is all a matter of identifying the challenges of life or a selected activity and duplicating the difficulties the activities present in an exercise routine.

In most cases, traditional strength training is combined with some added complexity. The different resistance modalities used in function-based training still require force production for increased muscular strength, but extend beyond the isolated contraction to cause proprioception and muscle recruitment from additional areas of the body. A good example would be a standing, single-leg chest press, using a cable machine for resistance. A movement such as this encourages total body muscle activity via a small base of support, kinetic transfer of energy through the tibia, trunk stabilization and asymmetrical force application, rather than just externally stabilized force production exerted by the pectoralis major, anterior deltoids, and triceps, as seen in a seated machine press. The forward press becomes increasingly challenging when the other difficult tasks are applied simultaneously.

The resistance applied to each movement can be as diverse as the movements themselves. As mentioned earlier, skill acquisition for new movements and less stable environments is often best applied using only body weight. New training techniques or previously mastered movements executed in an unfamiliar environment should be performed with the focus on proper movement technique rather than heavy resistance. The body must develop neuromuscular efficiency to balance and coordinate fluid movement before additional resistance can be applied safely and effectively. A natural continuum exists which requires proper progressions from the simple static maintenance of position to increased movement complexity under greater resistive loads. For example, before the single leg cable chest press can be introduced, the client must first become proficient at chest pressing with a cable and also be trained at standing on one leg. When the two acts are combined, the focus shifts from performing one task to performing two tasks simultaneously. If neither task has adequate efficiency, the movement technique is compromised.

The body uses its proprioceptors to control muscle contractions, which create the tension in the muscle and connected structures required to prevent undesirable action. For instance, standing on a single leg requires balance so that one does not fall over. Muscle contractions within the leg, hip, and trunk allow an erect posture to be maintained while standing on one foot. These contractions are obviously different in specific tension development from those needed to stand on two feet. Whether sitting on a physioball or performing an asymmetrical press, each position requires proprioceptors to help stabilize the body. When a person first attempts to balance on one foot, the body often sways back and forth as the proprioceptors attempt to communicate the proper balance of muscle tension medially, laterally, anteriorly, and posteriorly. The faster the body commands harmonious tension, the more rapidly a person becomes balanced.

Stability in all three planes stems from trunk muscle activation. The responsibilities of the trunk musculature extend beyond the basic actions of trunk flexion, rotation, and the intra-abdominal pressure control associated with conventional abdominal training (5). This group of muscles finds additional responsibility once the movement switches from single plane activity to a multi-planar movement. Take the laundry example, for instance; bending over and rotating the spine to pick up a basket of clothes that sits in lateral proximity to the body requires numerous trunk actions. First, the muscles must contract to rotate the trunk to the desired position to be able to grab the basket; next, the internal trunk musculature must stabilize the spine to transfer ground reaction force up through the kinetic chain to initiate the lift through the legs, and then counter rotate and extend the trunk while still maintaining spinal stability to exert prime mover force of the upper body to raise the basket up to the top of the dryer.

In a closed kinetic chain, the trunk muscles must act to stabilize activities in all three planes of movement. They function synergistically to eccentrically decelerate trunk extension and rotation, while combining with the lumbo-pelvic hip complex to produce dynamic force. Other force couples act to accelerate, decelerate, and counter force agents so that movements can be performed without undesired interference (10). The complex interrelationship of the trunk and hip enables synergistically accomplished movements in a controlled fashion, such as described in the example.

This fact is extremely relevant when additional force production is considered. Before extremity strength can be developed, it is necessary to understand how the body’s musculoskeletal system is linked. Although squatting is basically leg and hip extension, the support mechanism of the trunk necessitates strong core musculature to stabilize the spine, allowing the resistance to be controlled by the prime movers. If the connecting bridge between peripheral movements is weak, then optimal strength cannot be developed because the middle will give way to the external stress. Simply put, “you are only as strong as your weakest
link.” Increased trunk stabilization properties allow for the transfer of energy from the ground to the active prime movers of the upper body. The bar-loaded back squat exemplifies the need for stability in the trunk to support the top-loaded weight; if it does not, the body will cave into flexion during the lift and the leg pressing action cannot be effectively performed. The ability to apply hip extension to weights held on the shoulder requires a fused, isometrically contracted system, so when the hips and legs provide vertical acceleration force, the stable axial skeleton also accelerates at the same rate pushing the weight upward. This is true for all top-loaded exercises. A standing military press, for instance, often necessitates less resistance than the seated military press due to the trunk stabilization requirements. When seated, the back support and reduced lower and central body stabilization requirements allow for more resistance to be applied upward. In the standing version, ground reaction force is lost along the kinetic chain where the stabilizers are not efficient, so the potential force is lost before it can be transferred to the bar. Power athletes, body builders, and older adults alike can all benefit from improved stabilization properties within the body, particularly during closed-chain erect posture movements. The better the body can stabilize its motion segments, the better it can transfer force.

~Key Terms~

**Functional training** – Training targeted at enhancing coordinated movements specifically designed at improving function in activity necessary for everyday living.

**Motor learning** – A series of sequential phases (cognitive, associative, and autonomous) involved in learning to perform a movement task in response to a given stimulus.

**Synergists** – The name given to a muscle which assists in performing the same joint movement as the agonist.

**Pectoralis major** – The large muscle connecting the anterior aspect of the chest with the shoulder and upper arm.

**Anterior deltoid** – The muscle of the anterior part of the shoulder connecting from the anterior border of the clavicle to the lateral aspect of the humerus.

**Closed kinetic chain** – Energy transferred through the tibia from a fixed distal position.

**Axial skeleton** – The bones of the skeleton including the skull, spinal column, sternum and rib cage.

A strong core foundation is also essential for actions that require movement with simultaneous changes in the center of gravity or force shifts from one position to another. This is particularly true when the body is required to stabilize the center of gravity over the changing base of support. This situation can be illustrated by shifting a bag of groceries from one carrying arm to the other under a normal gait cycle or carrying a box up a flight of stairs. When a new center of gravity is established, the body must stabilize this shift or the movement will fail. This may mean dropping the object to prevent a fall, or in some cases, the body can completely lose stability and yield to gravity. The core musculature is central to activities performed for enhanced functionality.

Functional training under these parameters expands training philosophies beyond the traditional exercise approach. For the fitness professional, functional training integrated into a personal training regimen provides answers for many of the concerns facing today’s clients. A lack of neuromuscular coordination results in compromised movement patterns and contributes to muscle imbalances which can lead to injury. In addition, and because normal movements are predominantly asymmetrical or one side dominant, using single plane muscle isolation activities to maximize strength does little to serve the physical training needs of most people (9). Fitness professionals need to recognize what activities will best elicit improvements in total health and functionality in their clients. Functional training works for all populations because the training enhances the performance of everyday actions and also expands the potential for improved performance in all activities.

Functional training provides a wide-ranging spectrum of exercise and movement options. Many new modalities have been developed to exploit the concept of movement with purpose. Physioballs, resistance bands and tubing, and specialized stability devices join the more traditional medicine ball and dumbbells as training equipment for movement enhancement. Each provides unique benefits in a well-planned training regimen. This is not to suggest that all other resistance tools have become obsolete but rather reflects the idea that a continuum exists between absolute scores of fitness and functional health for optimal quality of life. The graphs below represent the training responses from machine, free weight, and functional resistance modalities, respectively.
The above diagram represents the training response focus between the two training paradigms. While single plane stabilization training maximizes single plane strength and hypertrophy, functional training, by design, is employed to enhance stabilization and multi-planar function.

**Resistance Machines**

Strength Stability

The above diagram demonstrates the relationship between stability and machine training. Machine movements are typically performed in a single plane of motion and require little to no respective joint stabilization to execute the movement pattern. This is due to the “fixed” plane of motion that accompanies most resistance training machines.

**Free Weight Resistance**

Strength Stability

The above diagram demonstrates that there is a closer relationship between strength and stabilization when free weight resistance is used. This can be attributed to the increased neuromuscular control requirements of free weight training. However, typical free weight resistance training is generally performed in a single plane of motion, and once motor control has been accomplished the contribution from respective joint stabilizers diminishes.
The above diagram shows the different relationship between absolute strength and functional strength. This can best be exemplified by a power lifter and a lumberjack. The nature of the two physical tasks draws on separate components of functionality. While the power lifter may be able to lift a lot of weight a single time, he or she may not be able to optimally perform the daily physical requirements of a lumberjack, who must possess strength and endurance in multiple planes under asymmetrically loaded conditions.

Exercise Selection

Proprioception can be enhanced further using new movement patterns, changing sequences, adding less stable environments or postures, and even combining instability with asymmetrically resisted movements. Infinite movement combinations can be created from just a few categories. They include, but are not limited to, conventional resistance training movements, ballistic resistance training movements, stability training movements, multi-planar movements, and asymmetrical movements. Each holds merit as a single stress to the body but offers increasing benefits with categorical synergy when combined.

Exercise selection for function is based on the same factors as traditional resistance training; the only differences are the neuromuscular progressions (complexity of the movement) and a general understanding of two continuums: safety/effectiveness and stable-single plane/unstable-multi-planar. Almost any combination of categories can be used to transition from isolated to integrated training. The most important aspect of the programming is that the exercises be combined in the proper progression, accounting for proficiency and safety. As with any professionally developed exercise program, the modalities and techniques employed should be based on sensible evaluation criteria. It doesn’t make sense to utilize activities just because they exist but rather to select exercises that reflect the desired response for an individual client. Ideally, the program components should have a high degree of carryover to the target activity or goal.

**Exercise Variations**

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<thead>
<tr>
<th>Traditional</th>
<th>Hybrid</th>
<th>Functional</th>
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<tbody>
<tr>
<td>Bench press</td>
<td>Bench press on ball</td>
<td>Bench push-up with feet on ball</td>
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<tr>
<td>Squat</td>
<td>Asymmetrically loaded squat</td>
<td>Lateral asymmetrical cable squat</td>
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<tr>
<td>Romanian deadlift</td>
<td>Single arm deadlift</td>
<td>Single arm/single leg deadlift</td>
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<tr>
<td>Seated shoulder press</td>
<td>Single arm standing press</td>
<td>Walking lunge w/SA shoulder press</td>
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<tr>
<td>Seated row</td>
<td>Standing single arm cable row</td>
<td>SA cable row with reverse lunge</td>
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<tr>
<td>Ab flexion</td>
<td>Ab flexion on ball</td>
<td>SL ab flexion on ball</td>
</tr>
<tr>
<td>Back extension</td>
<td>Back extension on ball</td>
<td>Single leg good morning w/MB</td>
</tr>
</tbody>
</table>

SA=Single Arm    SL=Single Leg
Programming Considerations
The decision to incorporate functional exercises into a fitness training regimen requires forethought and design so that the activities complement the system of training with a focus on a goal-oriented response. Too often, exercise selection is based on convenience, or on “what’s new;” which does not lend itself well to the preset progressive design model. Programming decisions should first analyze what was found from a needs assessment. Second, the fitness professional should identify factors that may limit goal attainment or present obstacles for later improvements. Third, the programming concept should be holistic in nature but goal-oriented by design. This means incorporating regular activities for each of the health-related components of fitness, while implementing a periodized approach to the goals of the client. This basic program model is further complicated when the decision for functional integration is introduced. Questions of: “When do I do it?”, “How does it fit in?”, and “Will it take away from tangible results?” often arise as fitness professionals are faced with limited time and a wide assortment of exercise modalities.

Functional training can easily be integrated into any program, as long as the fitness professional understands the function of the exercise and the demands it requires for proper performance. In many cases, the functional activity modifies a conventional movement, so rather than replace an existing exercise, it expands the range of effectiveness. As previously mentioned, once a client has mastered a particular movement, the activity can be advanced to provide more difficulty in completing it. This is not to suggest that the leg press can never be performed or traditional exercises aimed at hypertrophy are all replaced with unstable, multi-planar movements but rather that activities that incorporate a functional approach improve the performance of movements. Look at these common examples of how functionality can be put into practice by just modifying a few variables.

<table>
<thead>
<tr>
<th>Traditional Program with Functional Activities</th>
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<tbody>
<tr>
<td>Back squat</td>
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<tr>
<td>Chest press on a physioball</td>
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<tr>
<td>Step-up with single arm overhead press</td>
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<tr>
<td>Modified pull-up w/feet on stability disc</td>
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<tr>
<td>Walking lunge with trunk rotation</td>
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<tr>
<td>Front raise superset with rear delt band pull</td>
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<tr>
<td>Lateral asymmetrical squat walks up and back</td>
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<tr>
<td>Closed chain single arm cable row</td>
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<tr>
<td>Tricep kickback with theraband</td>
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<tr>
<td>Single leg abdominal curl-up on ball</td>
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<tr>
<td>Bicep curl superset with calf raises</td>
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<tr>
<td>Opposite raise</td>
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</tbody>
</table>

The resistance used for each exercise will vary according to the neuromuscular demands of the stability and the complexity of the action. If strength and power are desired outcomes of the exercise, then the traditional formats, including intensity and set-repetition schemes should be used. On the other hand, if neuromuscular coordination and balance are the goal, more functional exercises should be emphasized. This allows a single exercise bout to address numerous variables as defined within the needs analysis. Essentially, the basic guide is logic. If it doesn’t make sense, it should not be included. If the movement patterns become faulty, exchange the complexity for an easier movement, increase stability or reduce the resistance. Again, exercise proficiency is necessary before adding any new stress.
Stability Considerations
A fitness professional can select a variety of tools when incorporating a stability component into a client’s workout; however, the client must be able to perform the activity with proper mechanics in a stable environment prior to utilizing a destabilization modality. For example, a client must be able to properly execute a stationary lunge with proper proficiency before using a stability disk under one foot. The rule applies to all forms of stability activities. Begin with stable, single-plane movement and progress to unstable, multi-planar movements. Taking small steps in a progressive manner allows the body to adapt to the new training stimuli while maintaining the integrity of the movement.

Stability Progression
1. Standing cable press
2. Standing cable press one arm
3. Standing cable press one leg
4. Standing cable press one arm, one leg
5. Standing cable press on Bosu or balance disc
6. Standing cable press one arm on Bosu
7. Standing cable press one leg on Bosu
8. Standing cable press one arm one leg on Bosu

Multi-task or Multiplanar
Using the previous example, the press can also be performed in conjunction with any number of other exercises. For example, when combining the cable press with a forward lunge, the movement becomes more neuromuscularly challenging. To further add to complexity, the press can be done with one arm, causing asymmetrical loading while lunging. If more stability is required the lunge can be performed on a stability disc. Combining planes of movement can also be used to create more neuromuscular difficulty. Performing the lunge with high to low cable rotation employs the sagittal and transverse planes simultaneously. The combination of planar movements increases the proprioception and stability requirements throughout the body.

Example of Increasing Neuromuscular Difficulty
1. Walking forward lunge
2. Walking forward lunge with trunk rotation
3. Walking forward lunge with high to low alternating diagonal chop
4. Reverse lunge with trunk rotation
5. Reverse lunge with high to low alternating diagonal chop

Types of Resistance
Consistent with all forms of resistance training, the resistance used must meet the specific goals of the client and must also best match his or her abilities. General skill acquisition principles apply before progressing to different forms of resistance. The type of resistance used may make the exercise easier or more difficult, depending on the characteristics of the movement. Bands, balls, cables, dumbbells, and gravity all hold merit within a program but should be evaluated on a case-by-case basis. Bands offer increasing and decreasing resistance based on the elastic properties and can be used in any direction, independent of gravity, to provide resistance. Cables provide the same variation of resistance angle, yet the resistance remains constant throughout the range of motion. Dumbbells and medicine balls use gravity and therefore, reduce lateral pull unless asymmetrically loaded. Even barbells and body bars can be used asymmetrically for greater resistance and stability requirements, which are increased due to the long length of the bars. The exercise selection and number of repetitions performed will often dictate the appropriateness of the resistance. Higher intensity lifts require stable movements; as stability decreases, resistance should decrease proportionately. There comes a point when an activity has reached its safety/effectiveness limitation and adding more resistance becomes undesirable. Making responsible program decisions is necessary to maintain safety while implementing exercise progressions.

Example of Increasing Training Resistance
1. Box step-up
2. Box step-up with two dumbbells
3. Box step-up with single dumbbell
4. Box step-up with asymmetrical medicine ball loaded on the shoulder
5. Box step-up with medicine ball front pass

Range of Motion
The client’s functional ROM and his or her ability to adhere to proper technique throughout the activity should determine the movement range of the exercise. The first rule of thumb is to lessen the resistance if the desired ROM is not attained. In some cases, the non-traditional movements identify flexibility limitations and muscle imbalances. If flexibility limits proper technique, the exercise should either be exchanged for a different movement or performed within the limited functional range. Flexibility is a factor of the range of motion attained during physical activity. Therefore, encouraging exercises in uncommon planes of
movements may enhance ROM, particularly when complemented by a comprehensive flexibility program used in conjunction with the resistance training program.

**Velocity**

Velocity has particular relevance and application when using complex movements and ballistic activities. Throws can be performed in any number of ways and directions to incorporate a wide variety of force couples in the trunk and appendicular musculature. The intensity of the activity can be easily manipulated by adjusting the speed of movement or weight of the ball. The standing medicine ball chest pass, for instance, can be a relatively high intensity activity when requiring the user to produce maximum force and velocity, or it can be of relatively low intensity when only working on coordination and dynamic ROM. The speed of the movement should comply with the desired outcome and allow for proper movement execution. If the speed causes incorrect movement patterns, it should be reduced.

**Sets and Reps**

The number of sets and reps used in functional training will be client and goal specific. In some exercises, the client may have difficulty executing the movement, so repetitions should be designed around skill acquisition. As the client improves, total training volume and exercise intensity can be increased. The evaluation of exercise execution during multiple sets and the performance of higher repetition schemes will determine the time and the quantity of any subsequent increases in difficulty.

**Equipment Considerations**

Each piece of exercise equipment designed to enhance functionality works to move the body from stabilized single-plane training into less stable multi-plane environments. Therefore, the equipment selected should reflect this goal. The ideal piece of training equipment for functionally-based training combines resistance with a high proprioceptive demand. This can only be accomplished if receptors in the joints and muscles

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**Functional Training Program Recommendations (9)**

- **Programming** – Use a holistic approach with sound training principles applied to goal attainment.
- **Focus** – Concentrate on the desired outcome with a balance of the safety/effectiveness continuum.
- **Progressions** – Analyze all physiological considerations before deciding on the direction and rate of progress. Use appropriate levels of training for each phase of training.
- **Skill acquisition** – Only utilize an external load after central nervous system proprioception feedback develops successful stabilizing patterns used for postural equilibrium. Act on system and joint stabilization.
- **Multi-planar** – As progress is made, attempt to engage all three planes simultaneously.
- **Move in 360 degrees** – Identify the role of gravity, momentum, and ground reaction forces and attempt to incorporate activities which exploit their benefits.
- **Velocity specific** – Once the movement becomes efficient, attempt to mimic the speed of the activity being trained for.
- **Activity specific** – Rehearse the activity within progressively different environments and conditions.
- **Balance** – Incorporate unstable environments to increase proprioception and develop improved functional strength.
- **Multi-joint** – Follow the kinetic chain sequence of the movement to cause all joints to function synergistically.
- **Integrated exercise** – Combine muscle systems and movements for neuromuscular efficiency and fluid movement performance.
- **Diversify** – Make exercise selections based on outcome specific response; this may require a combination of traditional training, functional training, and general conditioning all in the same workout.
Examples of Functional Based Training Movements

Asymmetrical Step-up

Start with one foot centered on the box, with the hip and knee flexed to approximately 90 degrees; the other leg will be located lateral to the box and under the hip. Hold a medicine ball or similarly weighted object over the outside shoulder. Step-up by extending and adducting the hip while extending the knee; the spine should remain in neutral position. Once the hip and knee are fully extended descend back to the start position. The back should remain flat during the entire movement. The speed of the movement will vary based on the objective of the exercise.
Examples of Functional Based Training Movements Continued

Lunge with Rotation

Start in an upright posture with feet under the hips holding a medicine ball at chest height with a neutral grip, arms flexed. Step forward into a lunge position by flexing the knee and hip. Simultaneously extend the arms and rotate the trunk moving the medicine ball in the transverse plane to a position outside the hip; the back should remain flat. Once full range of motion is reached, counter-rotate back to the start position while extending the front knee and hip. Once the start position has been reached repeat the movement to the same side or alternate to the opposite side.

Overhead Asymmetrical Squat

Standing in an upright posture with feet at shoulder width, grasp a dumbbell in one hand and hold it just above the shoulder with a flexed arm position. Descend into a squat position by flexing the hips and knees while keeping the back straight. As the descent is initiated press the dumbbell overhead by abducting the shoulder and fully extending the arm. The opposite arm should remain at the side of the body. Once a full squat position has been attained extend the knees and hips to return to the start position with the arm extended overhead. Bring the resistance back down to the initial position and repeat the movement. Latissimus dorsi flexibility is a factor in this movement which may cause the resistance to migrate into the sagittal plane.
Band Row Sequence

Start in a split stance position holding the band handles with the arms extended and shoulders horizontally adducted at chest height. Initiate the movement by retracting the scapula and flexing the arms while horizontally abducting and extending the shoulder. The back should remain flat with the abdominals isometrically contracted. Return to the start position in a controlled manner moving through the same plane of motion. Once proficiency has been established the exercise can be advanced by alternating rows and asymmetrically loading the movement. To increase the complexity, the exercise can be performed while stepping backward into a reverse lunge position. The movement is initiated with a backward step. As the knees and hip flex the shoulders are horizontally abducted and extended while the scapula retracts and arms flex in a fluid manner. Once the full lunge and pull position have been reached the client returns to the start position and alternates sides. This movement can also be performed using the asymmetrical row for increased trunk activation.
Examples of Functional Based Training Movements Continued

Physioball Push-up

Assume a straight body bridge position on the ball; feet on the floor with arms extended and hands in a neutral position. Descend to the ball by horizontally abducting and extending the shoulder while flexing the elbow. Lower the body to a point just above the ball in a controlled manner. Keeping the spine and hips in neutral position, press the body back to the start position stabilizing the ball to prevent any lateral movement. The feet should remain fixed throughout the movement. Once the arms are fully extended, but not locked, repeat the movement through the same plane of motion. The exercise can be made more difficult by aligning the feet close together or lifting one leg by extending the hip during the movement. The larger the ball, the easier the exercise is to perform. The trainer should spot the ball to prevent undesirable lateral movement.

Asymmetrical Romanian Deadlift

Standing in an upright posture with feet located under the hips grasp a single dumbbell using a pronated grip. The arm should be extended with the resistance located just in front of the hip. Initiate the movement by flexing the hips while slightly flexing the knees. The back should remain flat as the resistance is reached downward toward the ground. Once full range of motion has been reached the hip, back, and knees should be extended maintaining a flat back position. The exercise can be made more difficult by performing the lift on one foot. A common error is to continue to flex the knees throughout the downward phase often due to tight hip extensors. In many cases hamstring flexibility limits the movement range.
Band Press Sequence

Start in a split stance position holding the band handles with the arms flexed and shoulders horizontally abducted at chest height. Initiate the movement by pressing forward extending the arms while horizontally adducting the shoulder. The back should remain flat with the abdominals isometrically contracted. Return to the start position in a controlled manner moving through the same plane of movement. Once proficiency has been established the exercise can be advanced by alternating presses and asymmetrically loading the movement. To increase the complexity the exercise can be performed while stepping into a lunge position. The movement is initiated with a forward step. As the knees and hip flex the shoulders are horizontally adducted and arms extended in a fluid manner. Once the full lunge and press position have been reached the client returns to the start position and alternates sides. This movement can also be performed using the asymmetrical press for increased trunk activation.
Examples of Functional Based Training Movements Continued

**Medicine Ball Reach**

Standing in an upright posture with feet approximately shoulder width apart, grasp a medicine ball using a neutral grip. Initiate the movement by flexing the hips and slightly flexing the knees. The shoulders will flex as the arms are reached forward. The back should remain flat throughout the entire movement. In most cases, hamstring flexibility will determine the degree of knee flexion and latissimus dorsi flexibility may limit the degree of attainable shoulder flexion. Once full functional range has been attained, return to the start position by extending the back, hips, and knees while maintaining the flat back position. The exercise can be varied by reaching in different directions. To increase stability the exercise can be performed on one leg and/or asymmetrically loaded. The back should not round during any phase of the activity.

**Alternating Prone Row**

Lying in a prone position on the physioball with feet on the ground in a parallel position, flex both shoulders and extend the arms forward toward the line of the resistance. Grasp the handles of the bands or cable using a neutral grip. The body should be straight with the pelvis and spine in neutral position. Initiate the movement by extending the shoulder while flexing the arm. Pull the handle to a position in line with the chest as the shoulder is hyperextended. The body should remain in a stable straight position. Return the resistance to the start position in the same plane of motion while simultaneously contracting the latissimus dorsi and flexing the arm, pulling the opposite handle toward the body. The exercise will become more difficult by employing a single arm, loaded asymmetrically or by lifting one leg off the ground using hip extension during the pull phase.
Examples of Functional Based Training Movements Continued

**Physioball Lateral Pullovers**

Lying in a supine position on the physioball establish a bridge position with the hips extended and knees flexed with feet flat on the floor. Reach the arms overhead by flexing the shoulder and extending the elbows. Grasp the handles with a pronated grip. Initiate the movement by extending the shoulders and flexing and rotating the trunk. Maintaining a straight arm position, pull the handles to a position lateral to the hip. Once full range of motion has been attained, return to the start position through the same plane of motion. At the start position perform the same movement to the other side of the body.

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**Chapter Twenty References**