Corrective Exercise

Corrective Exercise

Prior chapters emphasized that a strength coach's primary responsibility is preventing injuries to his or her players while facilitating improved play. Therefore, the patterns of dysfunction discussed in the previous chapter warrant detailed attention that strives to correct both imbalances and deficiencies in physiological function. Doing so promotes a more efficient system of stability and movement during training and sports participation. Program design must account for these issues while removing the undesirable adaptations that inhibit performance. For many coaches, this creates a conundrum: practical concerns and the expectation of success in team sports suggest the "machine" must keep moving forward regardless of the risk for casualties. Thus, coaches must constantly focus their efforts on the development of strength, power, and speed from a team perspective, while simultaneously addressing obstacles that limit improvement or present risk of injury for individual players. Many athletes are extremely resilient; nonetheless, appropriate corrective provisions are essential. Proper technique, thoughtful exercise selection, and when necessary, modification employed for correcting limitations can all help maintain physical capabilities and achieve desired goals.

The concept of **corrective exercise** is by no means novel, but it has become corrupted in professional practice in both fitness and sport training environments. However, legal implications demand that the strength coach understand the difference between exercise for adaptive improvements and exercises that are associated with diagnosed pathology and only appropriate for clinical rehabilitation. A strength and conditioning coach is neither a physical therapist nor an athletic trainer, and must recognize the separate, defined roles of each profession. There is a continuum of care that exists between allied health providers and the strength and conditioning coach. When a player is injured, each role is clearly defined and all should work cohesively to restore function. This continuum will often start with a physician who prescribes physical therapy for specific rehabilitation. Upon appropriate clearance, athletic trainers will provide ongoing therapies before the strength coach takes over. Cooperative interaction between the strength coach and the athletic training department is essential to returning a player to active duty as early as possible.

DEFINITIONS

Corrective exercise –

Activities aimed at restoring or improving joint function via neuromuscular and musculoskeletal system improvements

Quantifying Levels of Dysfunction

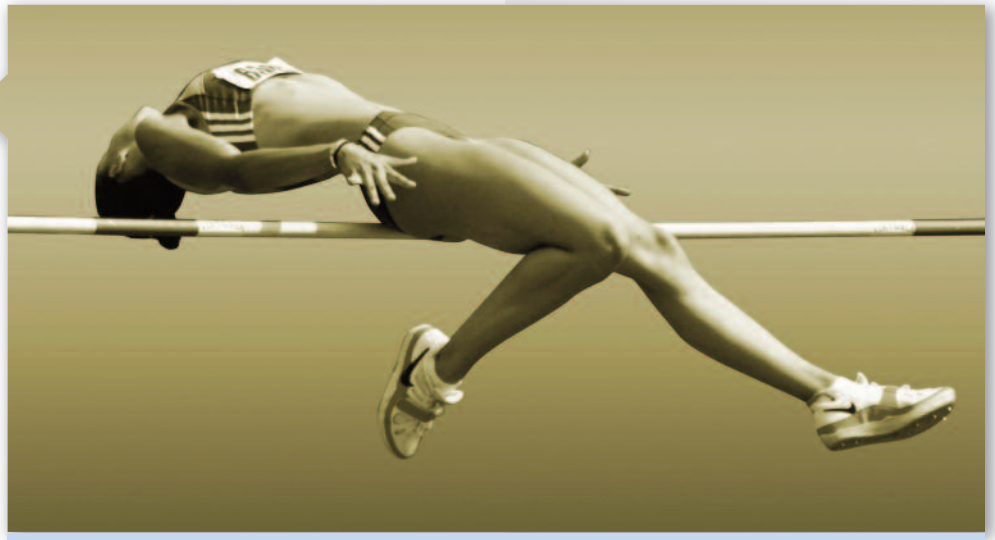
When no pathology exists, dysfunction should be managed through the same means as other adaptations designed to improve performance. The grade of dysfunction and its consequent effects on movement efficiency should guide the exercise selection process. Adjunct work performed in conjunction with the athletic training department may be warranted in cases of chronic issues, such as recurring low back pain and impingement syndromes. Otherwise, a three-level system is commonly used and can easily be implemented based on the athlete's or teams' specific needs. Level three suggests that dysfunction is most significant and identifies it as a definite impediment to performance. Level three issues warrant immediate, corrective strategies which can be implemented during the warm-up, built into the core components of the exercise program,

and strategically employed during the cool down segment. Level two corrective strategies are geared toward issues that must be addressed before they progress in a manner that threatens performance and increases risk for injury. Although level two issues certainly act as resistance to movement, movement is what will correct the problem. Most commonly, the warm-up and core components of the workout can be tailored to address these issues. Level one distinctions are either a borderline need or something that should be maintained based on the demands of the sport. Even in areas where acceptable movement exists, an appropriate amount of attention is required in order to avoid a decline in functional status. A common programming error is too much or too little focus in a particular area. Proper periodization models and balanced design will aid in managing all three levels of function.

As with any adaptive strategy, the program should promote specific and quantifiable outcomes. Lengthening, stabilizing, connecting, and strengthening exercises may be employed independently, but optimally work together in a cooperative manner that manages dysfunction. This coordinated approach is most easily achieved in the preparation phases of periodization; here, a focus on activation, range of motion (ROM), and muscle balance logically serves the phasic goal of physical readiness. Secondary levels of function are usually accomplished by modifying traditional exercise selections; these activities must be purposeful, serving improvements in ROM, central or local stability, and force segment coupling. As the phases progress to heavier loading and velocity-based activities, the actions may still reflect functional emphasis.

Programming for Function

Writing programs using traditional exercise selection is relatively easy because the adaptations are well-known and predictable. Exercise decisions for correcting or facilitating a specific response for functional purposes are more difficult. In most cases, the purpose is to get muscle groups to activate properly, establish appropriate stability and energy transfer, move through a greater ROM, or communicate more efficiently. This does not require a database of activities; joints only move in so many ways, therefore adjustments to traditional exercises can be implemented to serve most intended goals. For instance, a traditional lunge may be modified via the load, direction, or complexity. If central stabilization is the goal, the lunge can be performed with the load held overhead; if cross stabilization is desired, the load can be switched to a single side. If the goal is gluteal activation and greater ROM, the lunge can be performed in the reverse direction. Finally, when connectivity or force coupling between motion segments is the goal, the lunge can be performed in a multiplanar fashion (e.g., forward lunge with resisted diagonal chop). Each of these modifications is purposeful and should be used accordingly, but the foundational movement is the same.



Exercise decisions must account for proper muscle group activation, establish appropriate stability and energy transfer, move through a greater ROM, and communicate more efficiently.

A second step (after exercise selection) to the decision-making process addresses the multifactorial nature of the program. Coaches must consider the season, available training time and resources, as well as the training tenure and number of athletes involved in the program. Additionally, the coach must recognize that external loading needs to remain consistent with the periodization model. If the periodization model requires higher loading or greater movement speed, but the actions and load being employed emphasize stabilization and ROM, the purpose and selection become inconsistent. Case in point: a coach has an athlete with the inability to maintain pelvic integrity during a back squat, placing significant stress on his or her lower back under loaded conditions. The current phase in the program cycle calls for a 75-85% 1RM loading range. With the athlete's current flexibility and stability issues, he or she cannot safely back squat. Therefore, the exercise should be considered contraindicated. In this case, the same loading

The following considerations represent programmatic techniques which have shown significance in research and hold merit in different aspects of program development. The decision to use one or more of these concepts depends on the specific situation and current resources afforded a coach at a given time.

1. Motor unit synchronization increases muscle stabilization and strength

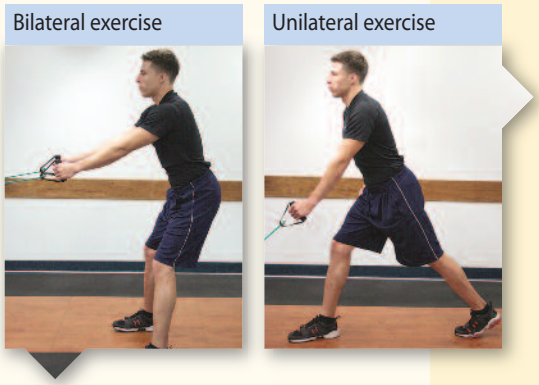
Practical implications: Train movements, not muscles, and select exercises that connect the sling systems. For instance, a step-up that is unilaterally shoulder-loaded with a sand bag will engage the lateral system; a lunge with diagonal medicine ball chop will connect the posterior oblique system; whereas a step-back to high knee vertical jump will challenge the deep longitudinal system.

2. Mental focus and imagery increase the excitability of the CNS involved in movement and motion planning [1,2,3]

Practical implications: Emphasize technique focus and employ spatial control devices like targets. This requires appropriate starting points for quality movements, the ability to regress faulty movements, and the premeditated set-up of training environments to include a teaching stimulus. Tape lines, foot boxes, and painted locators on the wall or floor all serve this purpose as do motion glasses and other advanced technologies.

3. Stability fatigue leads to faulty movement patterns

Practical implications: Program movements based on the time the stabilizers are under stress and the current efficiency of the stabilizing system. For instance, the repetition range for an overhead loaded movement performed with a unilateral, alternating action should be programmed based on the trunk stabilizers, not the single limb action. (For example, one set of seven reps per leg of asymmetrically loaded, unilateral step-ups equals 14 reps of trunk stability effort.)



4. Unilateral contractions are associated with greater muscle activity, ROM and strength compared with bilateral contractions of the same muscle group

Practical implications: Start with unilateral training to optimize the muscles of each segment and prevent compensatory recruitment patterns. Unilateral-based movements increase localized recruitment in prime movers and increase proprioceptive activity. Unilateral exercises help to stabilize each motion segment, which is particularly relevant for the pelvis, preventing undesirable tilts and allowing the motion segment to attain an increased ROM. Collectively, improvements in movement quality increase the activity of associated stabilizers and prime movers. Additionally, overload can be attained with less resistance, reducing the likelihood of poor technique or "cheating" through movements at points of weakness.

emphasis (75-85% 1RM) can be applied to a different exercise such as a split squat or Bulgarian squat. The movement adjustment takes into account issues of flexibility and pelvic position with only limited loss in the desired loading goal. Additionally, the alternative exercise selection improves central stability in the trunk, localized stability in the hip and knee, and ROM in key areas that promote pelvic-spine function. The rationale here is to give the athlete a movement advantage rather than to hope for a strength advantage. The latter will benefit from proper, unrestricted movement as an afterthought while the injury risk is negated. Strength coaches must recognize the goal is to improve in sports performance, not weightlifting.

When attempting to improve programs through an integrated approach, several tactful considerations can aid in the decision-making process. In some cases, modifications are applied to

5. *Unilateral resistive exercise of a specific limb will also result in training effects in the unexercised, contralateral limb (known as cross-transfer)*

Practical implications: Use asymmetrical or unilateral activities to promote cross-education. Dominant side tendencies often lead to preference. Start unilateral exercises on the weak side first.

6. *Eccentric muscle contractions produce higher force than isometric or concentric muscle contractions, resulting in higher oxidative stress and greater muscle damage* [4,5,6,7,8]

Practical implications: Teach eccentric movements as a foundation for concentric movements. For instance, jump training should start with deceleration among young athletes – work on techniques related to jumping off a box prior to jumping on it. Likewise, for knee stabilization, teach the downward segment of the pistol squat to a bench or box (to 90°) to work on technique and recruitment before attempting the concentric phase. Sub-maximal, eccentric contractions should also be used when issues of muscle pain, detraining, or prior limb immobilization exist.

7. *Changes in sensory receptors (proprioceptors) may lead to disinhibition, resulting in increased expression of muscular force through improved motor control* [9]

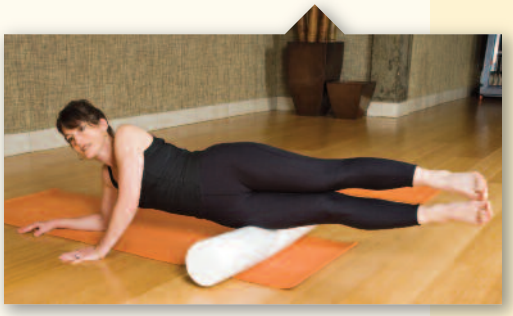
Practical implications: Use (antagonist-to-agonist) proprioceptive neuromuscular facilitation (PNF) contraction patterns to reduce resistance to movement and increase acceleration. A reduction in antagonist co-activation will allow increased expression of agonist muscle force, while an increase in antagonist co-activation is essential for maintaining the integrity of the joint. Ensuring muscle balance among prime movers at a given joint is critical. For example, if the hip flexors are overactive or tight during a power clean, the gluteal musculature will potentially be inhibited, reducing force through hip extension.

8. *Contractions at greater muscle lengths will transfer across more joint angles*

Practical implications: Using full ROM activities increases training effects across the kinetic chain. Lengthening the movement in all applicable muscles extends the reach of force across connecting fascia. Unilateral training increases movement range potential and subsequently ROM capabilities.

9. *Myofascial deformation contributes significantly to local tenderness and pain and may lead to motor dysfunction; muscle trigger points are associated with reduced efficiency of reciprocal inhibition, which may contribute to delayed and incomplete muscle relaxation following exercise, disordered movement control, and unbalanced muscle activation* [10]

Practical implications: Use dynamic and static ROM techniques in the cool down period, self-myofascial release (foam roll) techniques, and acupressure with a multi-level rigid roller to treat myofascial restrictions prior to training.



specific exercises, while, in others, the coach manipulates associated environmental conditions to create additional stress: for example switching from a weighted lateral lunge to a slide disc lateral lunge. Here, the movement is consistent, but the stress is due to an environmental change.

An integrated model of training should prepare the body for more traditional activities such as Olympic lifts, both unilateral and bilateral ballistics, and plyometrics. Some of the more progressive models of functional training erroneously de-emphasize a number of the traditional movements and avoid heavier loading. The reality is that many classic exercises and techniques are in fact crucial to success in sport training and should be included in some fashion. Consider the deadlift: it is absolutely necessary in order to accomplish pulls from the floor when using Olympic movements and serves as a necessary compound exercise to promote force coupling between motion segments. However, if tightness in the hip extensors exists, particularly with inadequate trunk stabilization, the outcome is an undesirable posterior rotation of the pelvis. These events collectively promote a rounded back position under load, making a relevant lift contraindicated for many athletes. Therefore, these issues must be addressed so the exercise can safely be included in a given program. It is important to recognize that there is always a way to solve these types of problems via exercise modification. In the current example, the traditional deadlift exercise could be modified to a wide stance deadlift (sumo deadlift) while adjunct work for spinal stabilization and hip ROM are addressed concurrently using other activities.

More recently, some practitioners have become overzealous in programming function-based exercises. This mistake can replicate the error of overemphasizing load as the primary impetus for continued adaptations. Excessiveness in either category reduces the attention assigned to athletic-based training. For instance, spending an inordinate amount of time on low-resistance trunk stabilization reduces the amount of time spent on promoting strength, power, and speed. Certainly, the athlete may be able to stabilize his or her spine during a plank, but at the risk of a pulled hamstring during a game due to a lack of prime mover strength. Additionally, coaches should recognize that the concept of integration does not suggest low intensity. Movements requiring increased balance and range may warrant an appropriate reduction in resistance, but the goal is to use exercises that move the athlete toward increased intensity and velocity, consistent with sport-specific requirements. A strength coach should emphasize athletic behaviors and load as appropriate for proper technique and the desired movement velocity. It is clear that higher load resistance training produces greater power and speed when used in proper conjunction with plyometrics and speed, agility, and quickness (SAQ) programming.

To effectively optimize sports performance and continue a developmental flow from season to season and year to year, the periodization model ideally should include an integrated approach. As detailed previously, the primary aim is to reduce restrictions, optimize technique, and increase the velocity of actions. This is best accomplished through thoughtful selection of interactive movements and load-specific adjustments with the goal of multiple outcomes. The idea of multiple outcomes, again, takes advantage of overlapping stressors. The overhead reverse lunge mentioned earlier functions to stretch and activate the gluteals, stabilize the pelvis, and can add stability in the trunk and shoulder joints through activation potentials not possible in the dumbbell or axially-loaded versions of the same exercise. Not every choice needs to be so dramatic, but it should be purposeful and consistent with athletic need.

Applications for Integrated Training

The following programmatic concepts provide a repertoire of techniques for specific or integrated applications of stress. To clarify, an example of a specific stress application would be an axially-loaded split squat; here the load presents the challenge. An integrated version would use asymmetrical loading (i.e., unilateral dumbbell overhead or unilaterally shoulder-loaded split squat), which challenges central and localized stability to a greater degree. The variations provide a coach with options; in this case similar exercises with two very different purposes.

One of the primary goals of integrated training is to use exercises that move the athlete toward increased intensity and velocity, consistent with sport-specific requirements. A strength coach should emphasize athletic behaviors and load as appropriate for proper technique and the desired movement velocity.

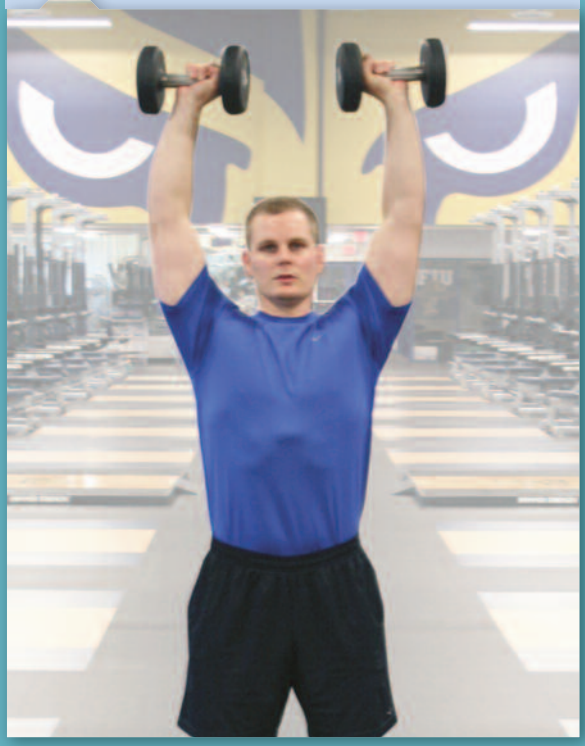
Rehearsal

Repeat exposure to a movement enhances proficiency and transfer into other movements. This maintains movement integrity when actions are compounded. Research indicates continued practice beyond that which is necessary to simply accomplish a task improves efficiency; on the other hand, limited exposure creates pathways that are easily disrupted [11]. For instance, if a lunge is flawed in technique and is repeated without discriminate execution, the action will not be properly patterned. As soon as a resistance or complex action is added to the lunge, the compounding stress will exploit the inefficiency of the original movement. This will consequently lead to an even more faulty movement pattern. If though, the action is constantly rehearsed and reinforced correctly, a coach can properly progress the movement to more challenging sport-specific actions.

Couples and Slings

Most athletes are introduced to training via bodybuilding exercises or a power lifting approach rooted in heavy sagittal plane movements. Faulty movements, muscle isolation, and skeletal imbalances create very specific recruitment patterns that are difficult to bypass and require re-education for correction. While it is always ideal to have the proverbial "clean slate," re-education may be effectively accomplished by utilizing muscle integration patterns. Programming exercises that unite functional couples can quickly take advantage of established strength and direct it toward more coordinated actions. This is also true of sling systems. To revisit the lunge exercise, a dumbbell-loaded forward lunge with the weight held at either side is managed

Closed Chain – Open Circuit

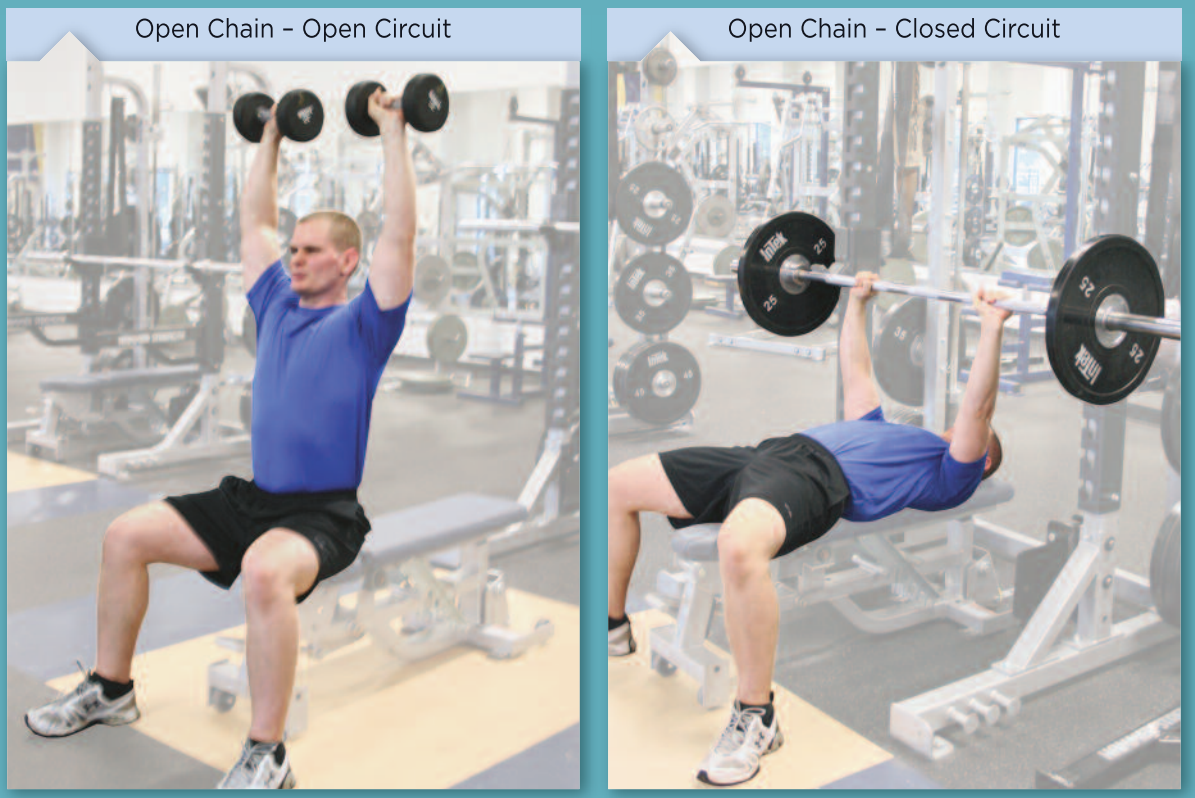


Closed Chain – Closed Circuit

very differently than one where the dumbbells are held overhead. Understanding the slings and functional force couples helps coaches decide on the best way to challenge the systems using different planes, movements, and loading conditions.

Chains and Circuits

Building upon the force couple concept, a closed kinetic chain requires the integration of ground reaction force and internal energy management [12,13]. Unless the goal is bodybuilding or isolated strength for localized muscle balance, the foundations of sport-based training should emphasize closed-chain activities. In a closed kinetic chain, force is applied to a distally-fixed position, forcing the body to stabilize segments so that it may accelerate and transfer the energy to accomplish tasks, as clearly seen in sports. For instance, a pull-up is closed-chain: the body moves around a distally-fixed bar position, requiring greater stability and improved activation. On the contrary, a cable lat pull-down allows the resistance to move around a distally-fixed body position stabilized by the machine, consequently reducing both stability and activation requirements of the body. Likewise, changes in the connection to the load, or kinetic circuit, determine stability demands. Open circuits use a single limb or unilateral load and require increased localized and central stability relative to the weight. A common example would be the dumbbell overhead press. Each shoulder must function independently, whereas in a closed kinetic circuit such as the military press, the joints function cooperatively. Chains and circuits can be manipulated to create the desired level of stability and ROM. Closed chains generally require more stability and force couples than do open chains. Open circuits promote localized stability and increased movement range, whereas closed circuits lessen this burden. Therefore, if range and stability are the goal, employ



closed-chain, open circuit exercises. For sports-related strength, use closed-chain, closed circuits; for body building, use open-chain, with open or closed circuit activities.

Bilateral and Unilateral

When imbalances present as postural distortions, traditional exercises become compromised. Pelvic instability and forward migration of the shoulder joints often lead to an inability to safely perform compound movements such as squats, deadlifts, the military press, and various ballistic activities, including the Olympic lifts. For optimal power and speed development, a coach must employ strategies to correct these problems while continuing to load the condition. For many athletes, the initial phases of training require significant emphasis on actions using a single dominant limb for loading or support. The purpose is to isolate a motion segment and stabilize the system thereby promoting increased ROM and local muscle activation. The loading employed is lower than the weight used in the comparable bilateral lift but not necessarily light; this allows joint positions of the spine and pelvis to be controlled during employment of full movement ranges. Earlier we discussed concerns of an athlete experiencing posterior pelvic rotation during the descent phase of a back squat exercise, compromising lumbar spine position in the process. The athlete may need increased core stabilization to prevent the anterior chain from pulling the bottom of the pelvis forward; they may require ROM improvement in the posterior chain to prevent the extensors from pulling back on the iliac spine, or they may require a combination of the two. As mentioned earlier, the bilateral squat may be switched to a unilateral exercise such as the Bulgarian squat (or other split stance variation), which would aid in functional efficiency and could be loaded according to need.

Asymmetrical and Unfamiliar

Asymmetrical loading suggests that the resistance is not equal in the frontal or sagittal plane in reference to the midline or mid-axillary line of the body. Unfamiliar suggests the loading is placed in a manner to which the body is not accustomed, or that the load is awkward or cumbersome to manage, creating variations in activation of stabilizing musculature. A sand bag placed over a single shoulder during diagonal step-ups is an example of asymmetrical loading, whereas bear-hugging a heavy bag during lateral squats is an example of unfamiliar loading. Both are used to increase force coupling and stability based on the specificity of the conditions. If, how-

Figure 5.1 Corrective Strategies for Common Issues

ONLINE VIDEO INSTRUCTION

Issue	Stretch	Move	Load
Tight QL	Self/Partner QL	Ipsi-Lateral QL Reach	(QL) Lunge w/Lateral Lean
Tight Hip Flexors	Hip Flexors/Adduct	OH Straight-Leg Lunge	SA OH Bulgarian
Tight Glutes	Partner Glutes	Reverse Lunge	Reverse Lunge off Step
Tight Hamstrings	High/Low AI	Split Stance Toe Reach	DB Split Stance RDL
Weak Mid Traps	Pecs/Lats/Abs	OH Band Squat	Cable IYT Pulls
Weak Protractors	Internal Rotators	Scap Push-Ups	Cable Punch
Tight Internal Rotators	Pecs/Subscapularis	IYT Reach	Prone TWL Reach
Tight Lats	Lats/Pecs	Split Stance SA OH Reach	Split Stance DB/OH Swings
Overactive/Tight Adductors	Short-Long Adductors	Unilateral Side Lunge	Band Squat/Slide Abduction
Overactive/Tight Abductors	Glute/TFL Stretch	Ipsi-Lateral Reaches	Slide Adductor
Tight Low Back	Piriformis/QL/LB Stretch	Wide Leg Back Reaches	Knee Rolls on Ball
Tight/Weak Abdominals	Hip Flexor/Abdominals	PB Prone Chest Raise	Hanging Leg Raise
Tight Obliques	Lat/Rotational Stretch	Split Stance Cross Reach	Lunge w/ Bar Rotation
Tight Calves (Heel Out)	Gastrocnemius/Soleus AI	SL Opposite Reach	SL Cable Reach
Weak Glutes (Knee In)	Hip/Flex/Adduction	High Box Steps	Reverse Lunge/High Step
Weak VMO (Knee In)	X-Leg Trans/Adductor	OH Bulgarian Reach	Pistols/Decelerator

QL = Quadratus Lumborum
OH = Overhead
COG = Center of Gravity
SA = Single Arm
RDL = Romanian Deadlift
AI = Active Isolation
TFL = Tensor Fascia Latae
LB = Low Back
PB = Physioball
SL = Single Leg
Slide = Slide Disc

ever, the difficulty in managing the load causes faulty movement patterns, the load should be adjusted. A common theme in quality instruction is to pay close attention to the details. Allowing only correct technique ensures quality movements all the time.

The proper use of the above techniques can dramatically improve problems that cause postural abnormalities as well as help to serve athletic movement. The adaptations promote skeletal function at desired joints, inclusive of both range and local and global stability. A strength coach ultimately must make program-related decisions based on need, so levels of integration may vary between practitioners during different phases of training. The integrated model itself can be used throughout a training cycle, but it has obvious merit in the preparation and endurance phases where movement quality and full ROM is emphasized over load. When determining starting points, the goal is to maximize the adaptation response. Ideally, the exercises selected will deliver multiple outcomes, but in some cases, a single or isolated challenge may be warranted. **Figure 5.1** represents some strategies for correcting the issues that commonly present difficulties both in the gym and on the field.

Implementing a Corrective Exercise Approach

Despite the clear benefits of an integrated training model and the problems associated with loading mechanical dysfunction [13], some coaches continue to program heavy, bilaterally-loaded, sagittal plane exercises with athletes who clearly present issues. Employing performance training over a traditional strength training approach allows recordable metrics to be quantified based on performance outcomes, not maximum weight lifted. The irony of the concept is that by increasing ROM, force coupling, and stability, athletes will be able to train more effectively for power and strength. Consider the Olympic clean exercise, a staple of any anaerobic-based sport preparation program. Its purpose is a strong kinetic connection with emphasis on powerful hip extension followed by rapid hip and shoulder flexion in the sagittal plane. The power clean's potential for sports lies in its relationship to horizontal running speed and vertical power. An athlete lacking a strong trunk will flex at the back. Similarly, those with tight hamstrings will lose pelvic integrity and migrate into a posterior pelvic tilt at the first pull; furthermore, tight hip flexors will inhibit upward extension, commonly observed as the undesirable "jump out" as the hip abducts. At the receive phase, tight latissimus dorsi and triceps limit shoulder flexion (low elbows) and promote scapular protraction and a round back. While these flaws are clearly counterproductive to the goal of the exercise, many athletes continue to use this technique. Coaches need to realize the superior benefits associated with quality movements, not movement for the sake of movement. Therefore, if the focus of training shifts towards technique, common corrective strategies would go a long way. Again, a reduction in load with adjunct work for optimal technique would prove effective for greater loading later in a training cycle. There is evidence that this lower-loading training strategy is a better model for global mobility [14], starting with improved motion and integrity at the site of dysfunction; subsequently resulting in improvements in both global stability and mobility. Collectively the outcome is improved capability in technique when loads increase. Consider the same concept for each of the compound exercises presented in Figures 5.2-5.8.

PRACTICAL INSIGHT

One of the difficult aspects of strength and conditioning is the time it takes to instruct proper movement and exercise technique. This creates a logistical problem due to the demands for immediate physical improvements. In team situations, the addition of multiple athletes requiring assistance at the same time makes matters worse. A couple of methods can be used to manage the difficulties associated with this dilemma. First, a coach should use training techniques in a highly repetitive manner during warm-up periods. Routine rehearsal in low-load environments helps to provide practice time before the exercises are added to the core component of the training bout. The second method takes advantage of the preparation and endurance phase by using an elevated volume with a limited set of movements. A coach is far better off having athletes perform several compound and ballistic exercises with perfect form than using a large variety of activities performed without quality execution. Foundational lifts practiced to perfection, coupled with corrective and athletic activities, can dramatically improve weight room outcomes.

Figure 5.2 Corrective Exercise for the Squat

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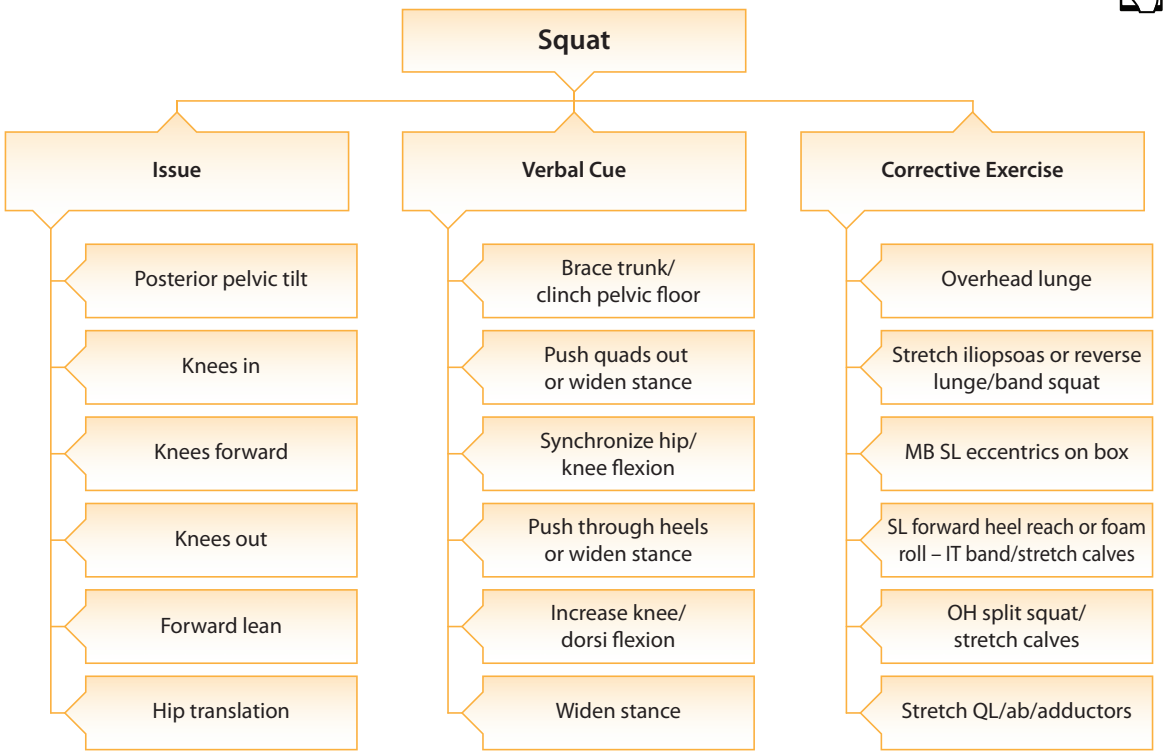

MB = Medicine Ball SL = Single Leg OH = Overhead QL = Quadratus Lumborum

Figure 5.3 Corrective Exercise for the Deadlift

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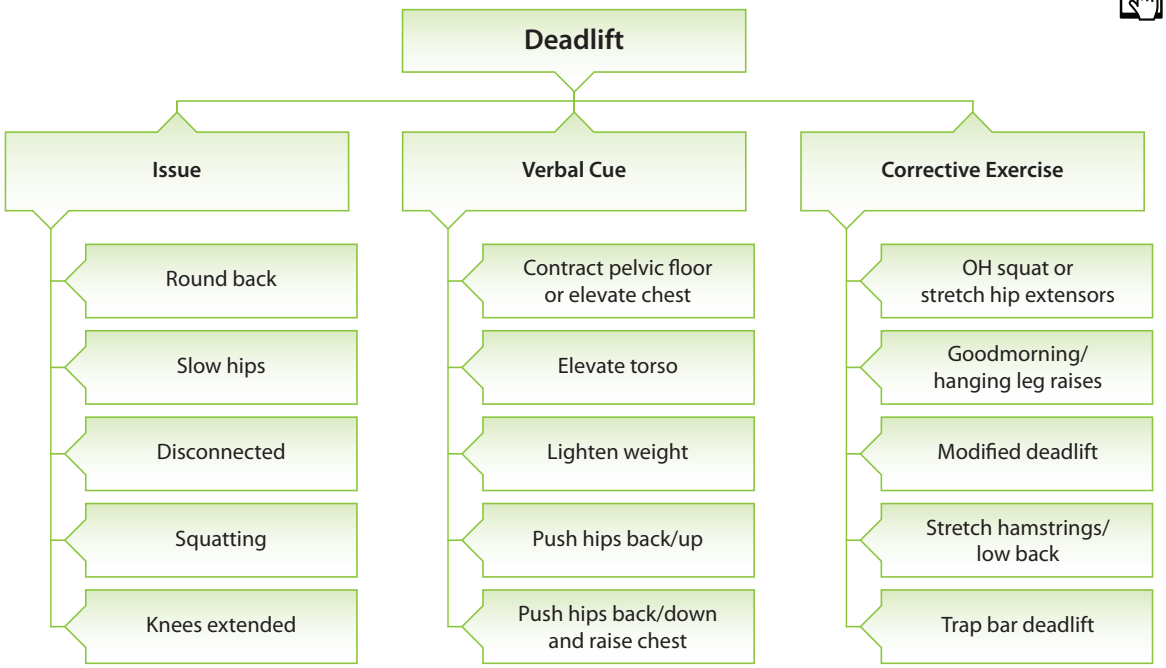

OH = Overhead

Figure 5.4 Corrective Exercise for the Military Press

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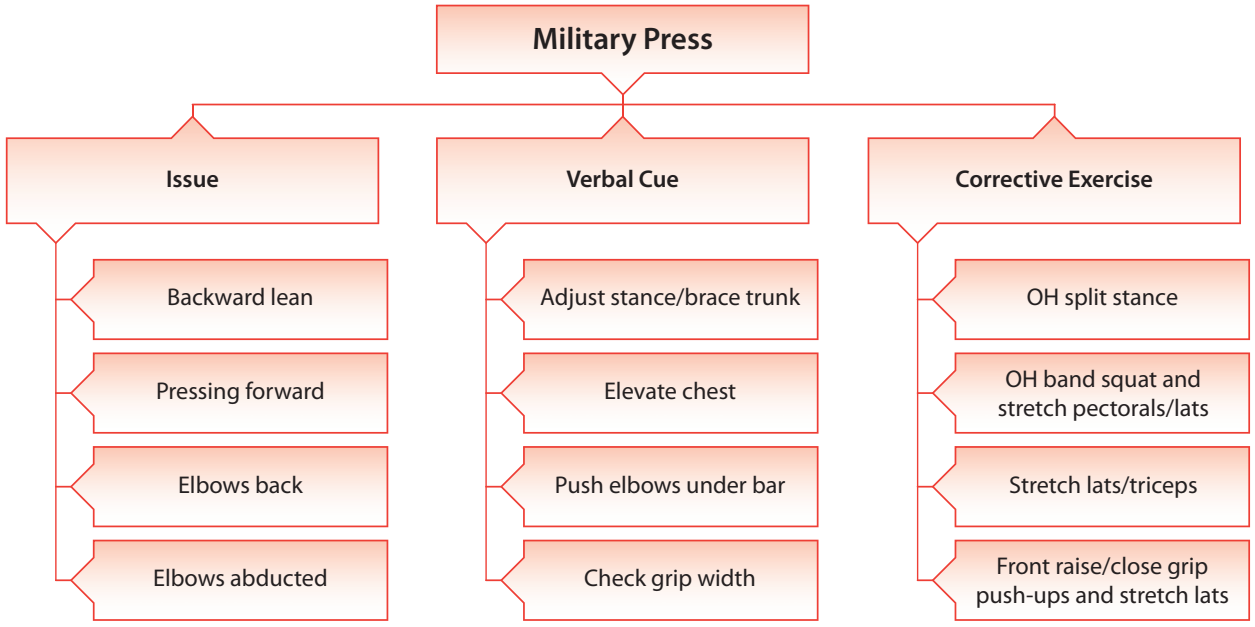

OH = Overhead

Figure 5.5 Corrective Exercise for the Bent-over Row

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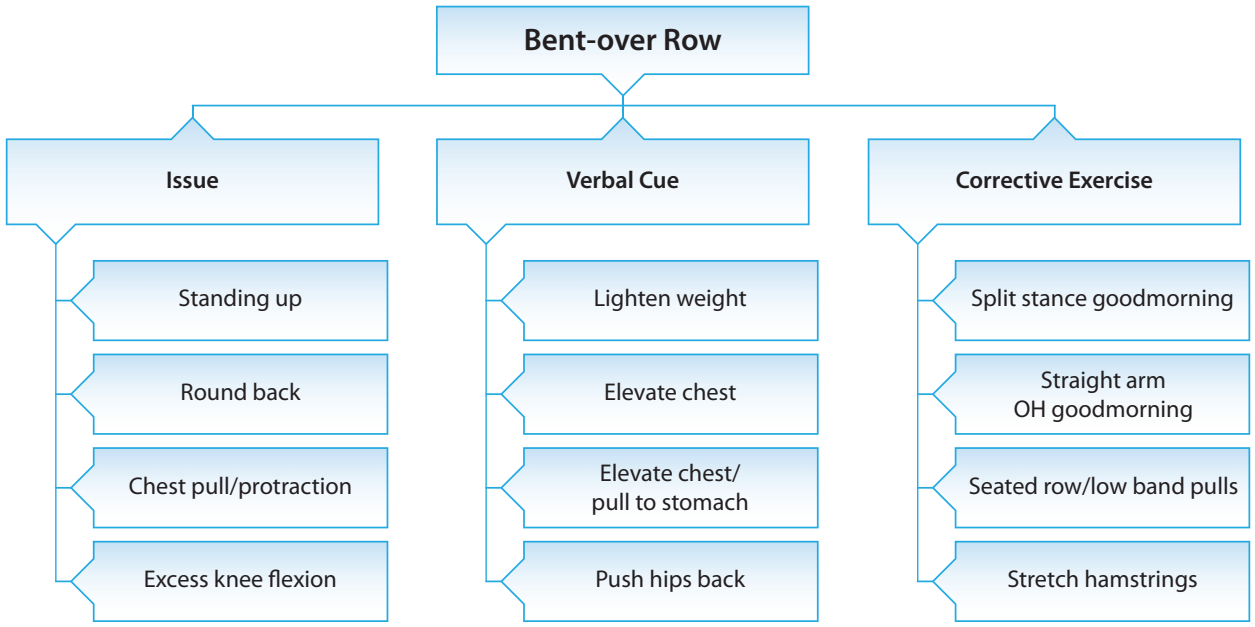

OH = Overhead

Figure 5.6 Corrective Exercise for the Bench Press

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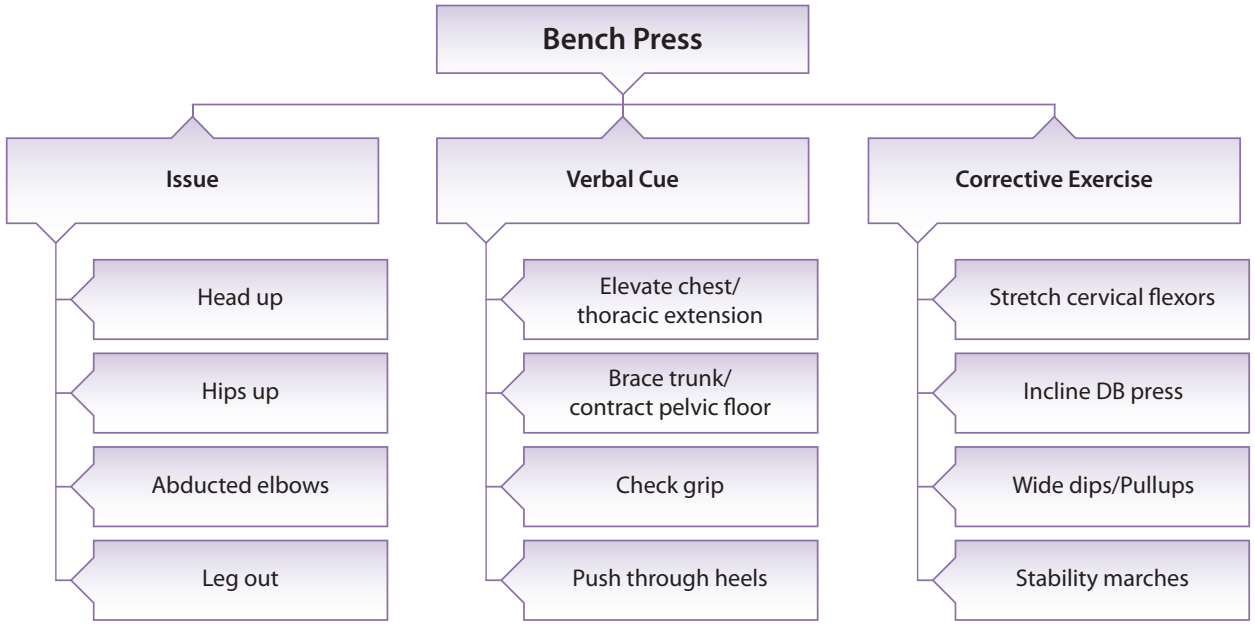

DB = Dumbbell

Figure 5.7 Corrective Exercise for the Lunge

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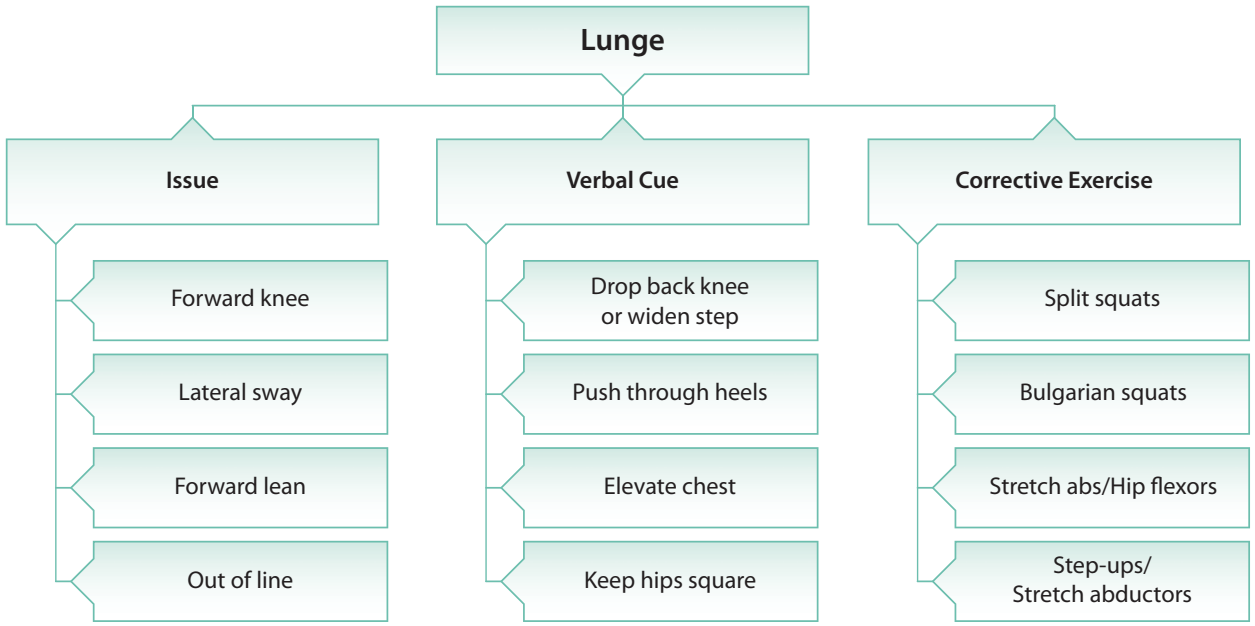

SL = Single Leg

Figure 5.8 Corrective Exercise for the Step-up

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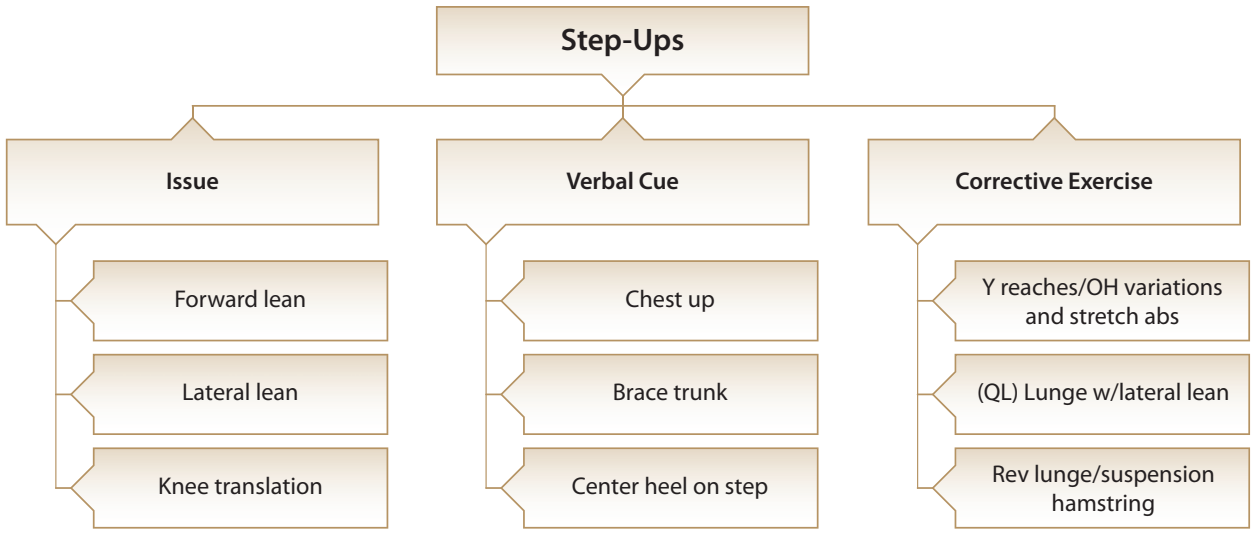

OH = Overhead QL = Quadratus Lumborum

Loading Variations for Improved Functionality

Different exercises have varied capacities for loading; often, stability and complexity determine the actual resistance applied to the movement. Quantifying an appropriate loading scheme is based on a variety of factors; but ultimately, the goal and capabilities of the athlete should always be prioritized. Depending on applicable factors, adjustments in the position of the load can help manage the stress for multiple outcomes over simply increasing it. Traditionally, load position has been dominated by the axial bar location or the lateral dumbbell locations. Revisiting the example of the Bulgarian squat, we have already stressed that split stance exercises can be used effectively for different benefits, but adjustments to the load can accommodate a more desirable effect. When front-loaded, the exercise is considerably different than when it is axial loaded or symmetrically laterally loaded using dumbbells. The following loading variations in Figure 5.9 provide more insight into this concept.

Figure 5.9 Practical Examples of Loading Modification for Integrated Function

DB = Dumbbell OH = Overhead

PRACTICAL INSIGHT

Split stances work optimally during performance of overhead loaded exercises for two reasons. 1) The pelvis is stabilized unilaterally and therefore allows the correct stabilizers to act on trunk. When overhead exercises are used in a neutral stance the pelvis has tendencies to move, compromising the stability and changing the muscle activation at the lumbopelvic hip complex. 2) When the hip is placed in a split position the latissimus dorsi experiences less restriction to full range. Split stance overhead exercises can be correctly performed as the position promotes both range and correct activation of the local muscles for stability.

Figure 5.10

All of the exercises in Figure 5.9 use the same movement foundation while adjusting them to reflect a desired goal. In many cases, the exercises selected to correct a problem do so by creating positions that promote greater ROM and local muscle activation. Connections across the body also help with natural motion and balance, allowing for segmental control that cannot always be attained using bilateral movements. When designing the activities to address a specific need, consider the different segments of the exercise program for opportunities to integrate the movements while staying on track with other goals. Sectioning the exercises into areas based on load and movement proficiency relationships will further enable progress toward functional development over the training cycle. The following sample program demonstrates how exercises can be segmented to optimize the training effect.

Sample Program for Functional Development

Phase: **Preparation (total body 3 days/week split)**
Goals: **Increase trunk stability, correct pelvic instability and mild upper cross syndrome**

General warm-up

- Jump rope 3 minutes

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Dynamic Warm-up

- Circuit#1 (10 rep total per exercise x2)
  - Reverse lunges w/ MB OH swings
  - Good morning with Y reach
  - Lateral lunge w/floor reach
- Circuit #2 (12 rep total per exercise x2)
  - Forward lunge w/diagonal reach
  - Good morning with ITY reaches
  - Theraband OH squat

Neural Preparation

- Tuck jumps with high knee 2x8
- Clean cycle 2x6
- Clean pull 3x5 (50% 1RM)

Core Components

- High pull (hang) 3x5
- Front loaded Bulgarian Squat 3x6 per side
- Ballistic step-up w/sandbag 2x12 per side
- Lateral kettlebell swings 3x6 steps each direction
- Bent-over row 3x8
- Alternating standing DB press 3x10
- Chin ups or modified pull-ups 3x amap
  - s/s with dips or suspension push-ups 3x amap
- Buddy hamstrings 3x4-6
  - s/s with hanging leg raises 4x6

Cooldown

- Suspension OH squat
- Split stance straight arm good morning holds
- Stretch hip flexor
- Stretch hamstring
- Stretch glute
- Stretch internal rotators

AMAP = as many as possible MB = medicine ball s/s = superset OH = overhead DB = dumbbell w/ = with

Integrating Functional Exercise

Many exercise variations can be employed to suit an athlete's experience, capabilities, and sport. This suggests that different programs may address the same problem in a manner more conducive to the situation or environment. Additionally, as an athlete progressively improves, initial issues may require less attention and program stressors may be geared toward other goals. For instance, if an athlete has minimal problems with skeletal function, more emphasis can be placed on loading or sling activation. It is simply a matter of staying on track so that programmatic variations are always purposeful and make sense relative to the training cycle.

Programming-wise, integrated exercises are consistent with traditional movements in that they should progress in a manner consistent with the force/velocity curve. This is a science-based approach to improving athletic development through a training cycle where interplay exists between movement, loads, and velocities. As mentioned earlier, the preparation and anaerobic endurance phases are heavily rooted in technique and tend to be more integrated, while the strength and power phases have a reduced emphasis in these areas in exchange for greater focus on improving acceleration forces. A matrix exists which may shift left or right based on the sport, season, and needs of the team or athlete.

Figure 5.11 Periodizing Applications of Integrated Stress

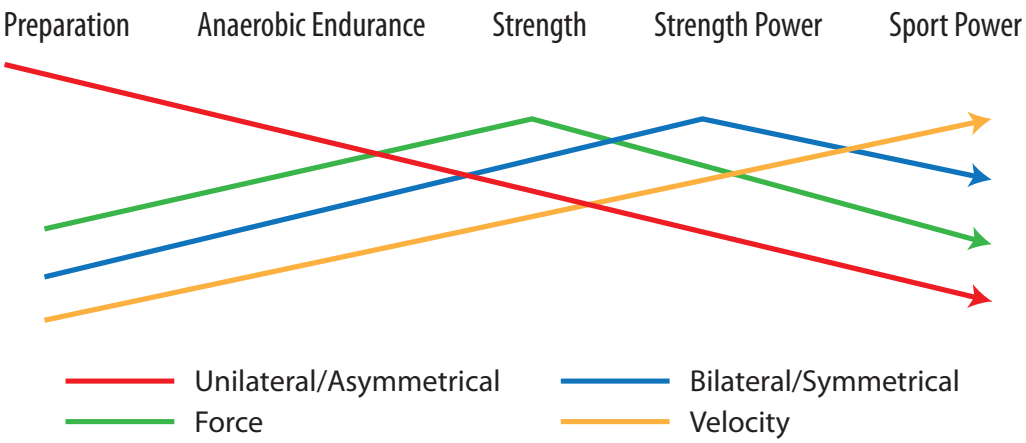

Figure 5.11 depicts a fairly traditional use of the force-velocity shift in conjunction with the integrated model of stability-loading. Consistently, during the preparation phase, greater emphasis should be placed on improving movement execution through activation, stability, and ROM. Anaerobic endurance is characterized by motor rehearsal of the previous phase while increasing stress and requiring moderate adjustments to exercise loading. The strength phase warrants additional stability to manage the increasing load and promote better connectivity between joint segments. Many of the unilateral and asymmetrical exercises will become symmetrical and bilateral at this point. Once loading reaches a desired level, the emphasis should switch toward ballistic actions in order to support the conversion of stable strength to increased velocity. Sport power reflects a greater focus on sport-specific velocity and athletic movements. This logical path of progression will be restricted without proper joint movement range and capable stability, leading to an increased potential risk for injury. Figure 5.12 follows a standard movement progression using an integrated concept applied to a standard progression model.

Figure 5.12 Integrated training concept for the step-up exercise

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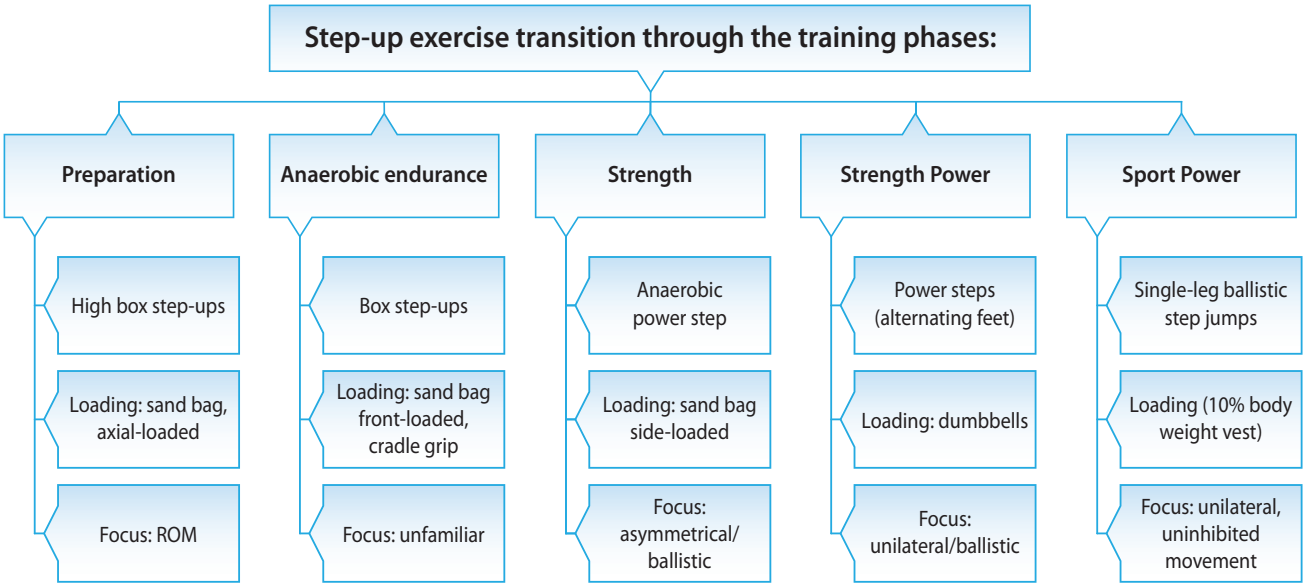

As depicted in the example, the same exercise can be used progressively to match the goals of any training phase. In many cases, the inclusion of the integrated paradigm can be blended with the conditioning program so that appropriate stress volume can be attained and properly balanced with the other goals of the training. Multiple weekly exposures will effectively increase the adaptation rate and reflect an optimal use of time. These concepts will be reviewed in detail in the following chapters.

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