Fundamental Movement Skills: Balancing Mobility and Stability

Of the three components of RAW functional fitness, movement skills tend to get the least emphasis. However, the other two components (strength and endurance) are largely dependent upon effective movement skills. There are countless examples of athletes with great strength that underperform because poor movement skills prevent weight room strength from translating to performance strength. Likewise, plenty of endurance athletes, especially runners, are either chronically injured or underperform because of movement deficiencies.

Efficient movement is a constant give and take between mobility and stability, with each segment of the body and its unique movement capabilities influencing all the other segments. When mobility and stability are in balance, and all segments are synchronized, movement is graceful and potentially powerful. When they are not, the result is often injury or disappointing performance. In this article, we'll take a look at the relative importance of mobility and stability at each of the major joints of the legs and trunk. Note that not all exercises recommended in the text are shown in pictures. Those that are not can be reviewed in the RAW PT Manual, v3.0, available on Darby.

Foot: The foot functions as both a mobile adapter to the ground beneath and a rigid lever for forward propulsion. About halfway through a typical step, the arch flattens to maximize contact with the ground. This flattening is called pronation, and is essential to efficient weight-bearing movement. Problems begin when pronation is excessive or prolonged. When this occurs, the connective tissues of the foot, ankle, and leg receive excessive strain that can lead to shin splints, tendinitis, stress fractures, knee pain, etc.

Excessive pronation also degrades performance. If the foot is still flat when it is time to push off to the next step, that step will be under-powered. A clear illustration of this phenomenon is running in sand. As the sand yields with each step, the foot is unable to efficiently stabilize for propulsion. To a lesser degree, the same thing happens with those who overpronate.

Although some Rangers need more mobile feet, by far the most common need is for increased stability to control pronation. There are a number of ways to increase foot stability. Start by spending significant time walking barefooted. This will stimulate the nerves of the foot that send information back to the brain and spinal cord. They in turn are more likely to coordinate a muscular response in the foot that leads to better control of pronation. In addition to simply walking barefooted, try standing on one leg and performing squats, leg whips, heel raises, and balance and reach exercises (the free leg or opposite arm reaches as far as possible in all directions, while maintaining good stability of the stance leg).

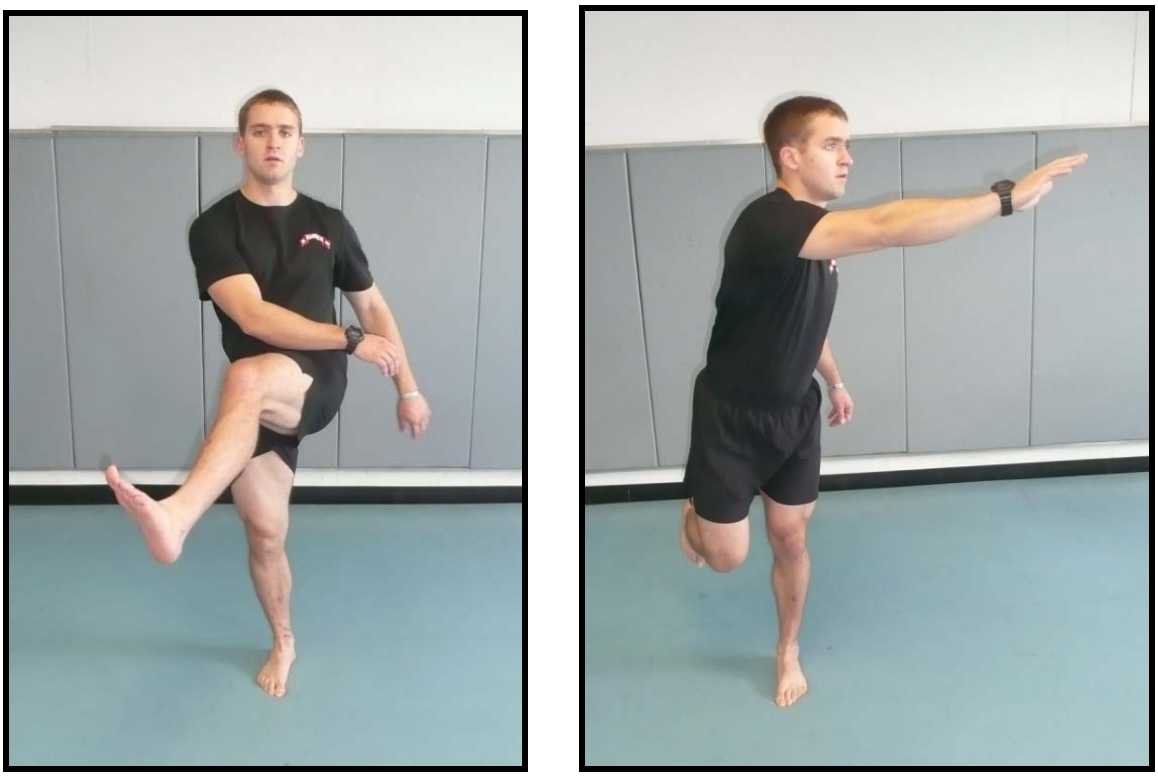

Figure 1: To improve stability of the feet, single-leg stance exercises with bare feet are useful. Shown here are diagonal leg whips on the left and rotational reaches on the right. Gently grip the ground with the toes. Keep a tall posture and limit trunk sway. Start with short, slow movements and gradually add range of motion and speed as proficiency improves.

Ankle: Although some Rangers have chronic instability of the ankle, the more common problem we see is a lack of mobility - specifically, the lack of dorsiflexion (the foot is limited in its ability to flex upward toward the shin bone by tightness in the calf muscles or ankle joint). When dorsiflexion is limited, the elastic energy of the posterior calf muscles is never fully utilized and walking and running are inefficient. In addition, when dorsiflexion is limited the foot will try to pronate more, leading to the problems mentioned above.

Improving dorsiflexion is sometimes as easy as doing the two-part calf stretch described in the Recovery Drill. Remember to perform the stretch throughout the day rather than just before or after PT. If you are unable to make progress, the problem may be in the ankle joint itself. In that case, see the battalion physical therapist.

Figure 2: The picture on the left shows optimal ankle flexion just before the heel rises during the walking stride. The picture on the right shows limited ankle flexion and is associated with an inefficient stride.

Knee: The knee is a hinge joint that permits only slight side-to-side and rotational movement. When those movements are excessive, bad things happen to good ligaments. So, at the knee, the concern is for having sufficient stability. The most common direction for excessive mobility is medial (the knee drifts inward creating a knock-kneed effect). We see this most clearly during single-leg stance squatting or during slow, controlled step-ups. Interestingly, it is not so much weak quadriceps that leads to excessive inward knee mobility, but rather it can usually be traced to weak hip stabilizers.

Below are several exercises used to improve knee stability.

Figure 3: On the left, side stepping against the elastic band builds lateral hip stability and thus better control of knee motion. Ensure that the trunk doesn't sway. On the right, the medial pull of the elastic band adds challenge to lunges or single-leg squats. Ensure that the knee of the stance leg does not drift inward.

Figure 4: The single-leg squat with medial rotation. This exercise challenges hip and knee stability. Do not let the knee of the stance leg drift inward. Start with short, slow movements and gradually add range of motion and speed as proficiency improves.

Figure 5: Use a weight as shown to counterbalance bodyweight and allow the trunk to stay perpendicular to the ground. The pictures on the left and center show optimal knee position. The picture on the right demonstrates poor right leg stability, as the knee drifts too far inward.

Hip: The hip is a very stable joint. The socket is very deep and the muscular support for stability is pretty substantial. Still, many individuals have poor neuromuscular control of hip motion and can benefit from exercises that challenge hip stability. (See figures 3, 6, and 7).

Insufficient hip mobility is also a common problem. Flexing at the hips is a key component of any lift from the ground. Rotating sufficiently at the hips is a key component of getting up and down from the ground, negotiating obstacles, and grappling. When these motions are limited, the body will try to complete the task by finding motion somewhere else – usually the low back, creating excessive strain there. To encourage better hip mobility, we have incorporated several hip mobility exercises in Movement Prep (squat, windmill, dynamic stretches) and Recovery (mountain climber, posterior hip and hip flexor stretches; seated hip rotations). If these movements are difficult, train them several times per day with strict form. If there is pain or you are not progressing, see the battalion physical therapist.

Figure 6: The single-leg squat variation shown on the left is a strong challenge to the hip stabilizers. The picture on the right shows excellent mobility of the right hip into extension during a lunge. This is also the position for stretch of the hip flexors of the right leg.

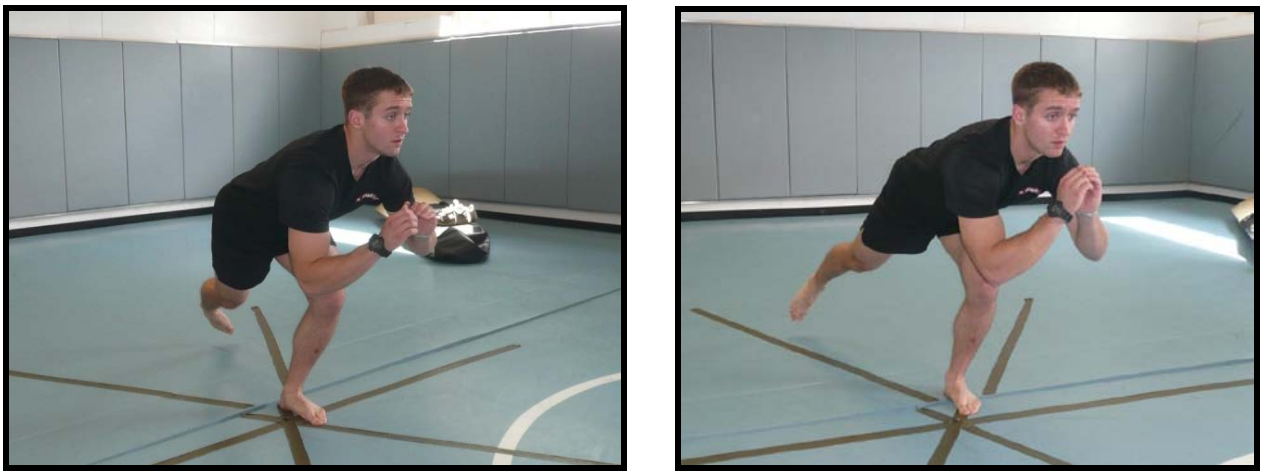

Figure 7: Balance and reach drills. The picture on the left demonstrates reach to the posterior left quadrant. The picture on the right shows reach to the posterior right quadrant. Both challenge hip mobility and stability. Note that the trunk and arms are forward for counterbalance. The rear foot does not touch the ground. This drill can also be used to assess side-to-side difference that might indicate an imbalance.

Low Back: Everyone has heard, "Lift with your legs, not your back." It is trite, but true. The big muscles of the legs are big for a reason – to generate power. Ideally this power is transmitted up to the arms by a stable trunk. If the trunk is not sufficiently stable, energy is lost and spinal tissues are strained.

Although we do have an exercise drill called 360 Core, developing core stability is not just a matter of performing those specific exercises (planks, bridges, etc). Instead, we should think of every lift or movement as a core exercise. When learning any lift or movement, we should be aware of the core's role in force transmission. Learn to set the trunk in a neutral position (the low back is neither arched nor flattened, but somewhere in between) and engage the core (cinching up the abs without losing the neutral position or inhibiting breathing).

We particularly like the Ground Base machines, deadlifts, and cleans for developing spinal stability. When performed correctly, all of those lifts train the body to generate power through the legs while maintaining a stable spine. Another favorite is the walking lunge with a plate held overhead or transferred side to side in coordination with the lunge (see figures 8 and 9 below).

Figure 6: Walking lunges with a plate overhead demands control of the core. Keep the core engaged throughout to limit trunk sway.

Figure 7: Rotating the plate across the forward leg adds further challenge to core stability. Keep the core engaged throughout to limit trunk sway.

Mid Back: The mid back or thoracic spine is where the ribs attach. This area is inherently stable. Our concern here is for lack of mobility. When the mid back loses mobility, it affects both the low back and the shoulders. In fact, many shoulder conditions get remarkably better by simply improving mid-back mobility through exercise or manipulation. Recovery Drill movements such as the scorpion and rotational spine stretch will aid in improving mid-back mobility. Many Rangers also report benefit from use of the foam roll. The battalion therapists are trained to manipulate the spine if necessary.

Figure 8: The foam roll can be used as shown to mobilize stiff thoracic joints and massage the mid back muscles.

Shoulder Blades: The socket of the shoulder is actually part of the shoulder blade. Therefore, efficient use of the shoulder demands mobility and stability of the shoulder blades. Think of a shoulder blade as the base of support for upper extremity movement. If it is not in the right place at the right time, or if it shifts to easily under load, then the whole movement breaks down. The victim in all this is usually the shoulder joint.

Generally, we see more issues with stability. Exercises such as the pushup+ and front-leaning rest rotations are designed to improve stability. Planks and side bridges can also be used for this purpose. Tight muscle groups around the shoulder blades can disrupt normal mobility. The most common culprit is tightness in the pecs, especially pectoralis minor. Tightness there limits upward rotation of the shoulder blade with overhead movement, and may lead to the shoulder impingement syndrome. The pec stretch in the Recovery Drill should be performed by most Rangers throughout the day. The teres major is another area where tightness can disrupt normal movement of the shoulder blade (see figure 11 below). A foam roll intervention is shown below. Because the muscular interactions around the shoulder blades are complex, Rangers with shoulder issues should get a thorough exam from their PT.

Figure 9: Tight muscles around the shoulder blades can limit overhead motion. Here the foam roll is used to increase extensibility of the teres major.

Shoulder: In contrast with the other ball-and-socket joint, the hip, the shoulder is inherently unstable in its shallow socket. Stability is created primarily through the muscular action of the rotator cuff. These relatively small muscles connect the shoulder blade with the upper arm. They enhance stability not through the production of huge force, but rather by exerting their force at the right time. For this reason, rehabilitating the shoulder is not as simple as strengthening the rotator cuff. We offer some suggestions below. Ironically for such a mobile joint, shoulder problems often involve a lack of mobility, especially internal rotation (parade rest position is an example). Corrective stretches for increasing internal rotation are best learned one-on-one with your therapist.

Although shoulder rehab is a bit more complex than the knee or ankle, and often requires significant one-on-one time with the BN PT, there are some suggestions that may help Rangers looking to prevent shoulder problems.

- Carefully consider the volume and intensity of overhead lifting. Anatomically, the shoulder is not designed to bear large, compressive loads. Such loads are inherent to pressing movements. Don't overemphasize the bench and military press in your strength training program. Do follow a strict, conservative progression of volume and intensity when training upper body push strength - think of development over months and years.

- Use the legs to get loads overhead. The clean and jerk, snatch, push press, Ground Base combo incline and zero machines are all good ways to train to lift overhead without isolating and perhaps overloading the shoulder joint. Having said that, remember that those lifts also come with some risk. Master the coordination of those lifts with light weight, feedback from a knowledgeable partner, and lots of

quality reps at the light weight. If you don't score a "3" on the Functional Movement Screen Deep Squat (see figure 14 below), overhead lifts with a barbell should not be attempted.

- We like the Turkish Get Up (see figure 13 below) for integrating the shoulder, core and legs. As with any complex movement, follow the advice from the previous bullet.

Figure 10: Overhead squatting is a challenge to stability throughout the core and shoulder girdle. Ensure you have sufficient shoulder mobility to keep the weight vertically aligned with the feet, not in front of the body.

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Figure 11: Performance sequence for the Turkish Get Up

Mobility/Stability Assessment: It is not always clear when a mobility or stability deficiency is present. For this reason, we recommend occasional screening by medics or PTs. We use the standardized Functional Movement Screen (FMS) to identify mobility/stability problems that might lead to injury or compromised performance. The FMS is not perfect, but it can often identify faulty movement patterns that can then be corrected.

If you have difficulty with any of the seven FMS tasks, the BN PT can perform a more thorough assessment and offer suggestions for corrective exercises. The objective of such screening programs is to ID and correct small movement problems before they lead to injury. We recommend that Rangers receive the FMS within the first two months of assignment to their platoon/section.

In the last few years, the FMS as helped a number of Rangers identify and correct pain and injury patterns that had previously compromised their performance. Two of our favorite FMS tests are the Deep Squat and Hurdle Step (see figures 14 and 15 below). The Deep Squat demands total-body mobility/stability (especially shoulder mobility, scapular and trunk stabilization, hip mobility, and lower extremity stability). A score of 3/3 should be a pre-requisite for overhead resistance training. The Hurdle Step demands stability on the stance leg and mobility from the other.

Though not a component of the 7-test FMS, we also value the Single-Leg Squat assessment. If as you squat the knee drifts toward the other leg or the pelvis drops on the unsupported side, those deficiencies need to be corrected, as they signal poor biomechanics that may lead to injury.

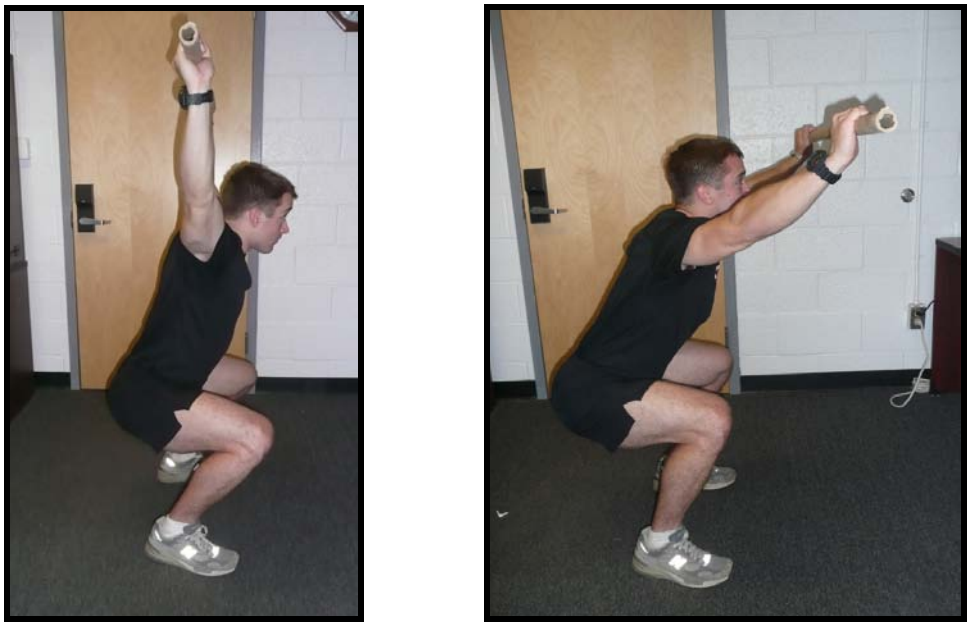

Figure 12: On the left is the Deep Squat test from the Functional Movement Screen. Note that the stick is maintained vertically aligned with the feet, representing good mobility/stability through the trunk and shoulders. For the max score of "3", this is the position you must achieve. On the right, the stick is well forward of the body, indicating deficits in mobility, stability, or both.

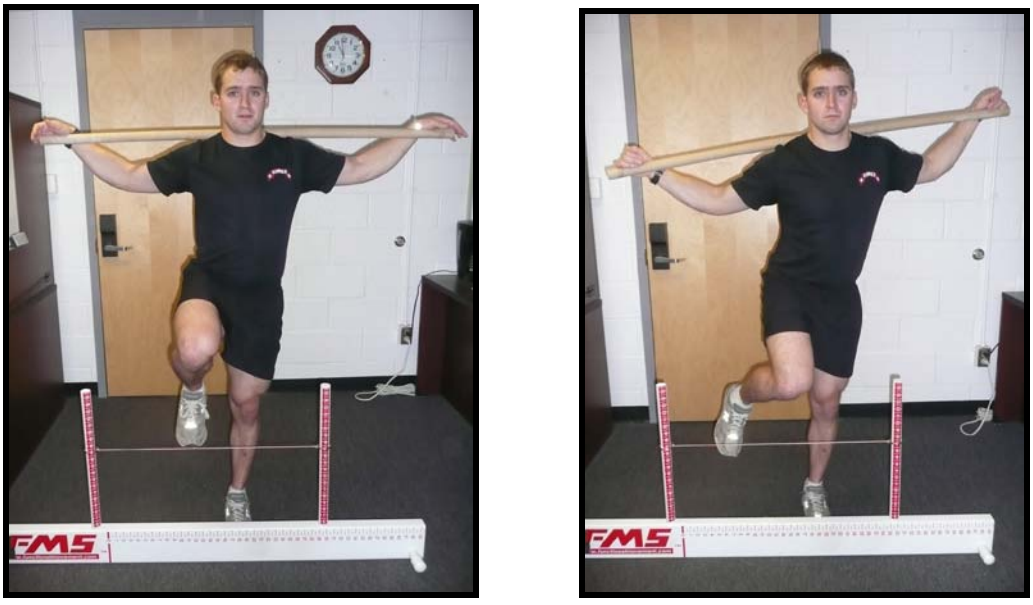

Figure 13: In these pictures, the Hurdle Step evaluates mobility of the right hip and stability of the trunk and left leg. Optimal execution is shown on the left. The picture on the right demonstrates 1) excessive hip rotation to clear the hurdle, and 2) poor control of trunk indicated by the tilting stick.