

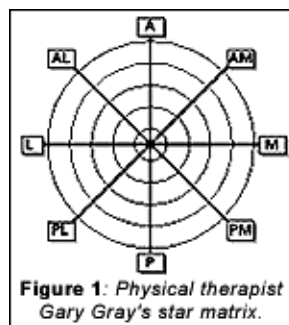
Are We Restoring Function?

By Craig Liebenson, DC

Many exercises "isolate" problem areas, but don't mimic the way muscles are used in the patient's functional activities. Such exercises may be important stepping stones in training, but they are not ends in themselves. This article will show how to make the exercise prescription match the patient's functional needs.

A valuable training principle to understand is that training causes "specific adaptation to imposed demands (SAID)." ¹² These adaptations are specific to the length, movement and speed of the exercise. ¹¹ An example is knee extensors (quadriceps) trained on the seated-knee-extension progressive resistance machine, that do not become stronger after training with a bicycle. ¹¹

An excellent illustration of functional exercises are the 3-D lunges, single-leg balance challenges and squats taught by Gary Gray, PT. ^{2,7,10} These utilize a **star matrix** floor pattern so that tri-planar movement (sagittal, frontal and transverse) can be trained (see **Fig. 1**). When unstable surfaces, such as a **stability trainer** or **balance board**, are used in conjunction with balance, lunge or squat exercises, the effects can be amplified. ^{4,6} Balogun demonstrated that by exercising on a balance board, lower extremity strength improved more than if four separate resistance machine exercises are performed. ¹ Similarly, Vera-Garcia showed that trunk curl-ups on a gymnastic ball increased oblique abdominal activity fourfold vs. floor training. ¹⁴



The primary goal of rehabilitation is to facilitate an individual's ability to manage daily tasks without causing pain or injury. Occasionally, manipulation is all that is needed to accomplish this. However, exercise is also frequently required. The problem in practice is determining the realistic targets of care. Specifically, can discreet functional deficits be identified that are related to a patient's daily activities? Can these be improved with manipulation or exercise?

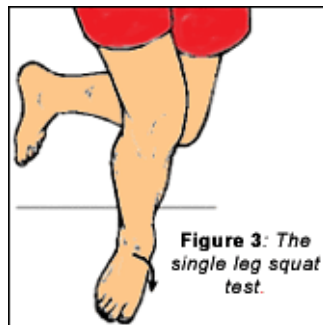
Assessment

How does a practitioner know if a patient's ability to manage daily tasks safely has been restored? If manipulation restores joint play and reduces painful range of motion, can it be assumed that daily activities are automatically stabilized? As numerous studies show that ROM impairments correlate poorly with activity intolerances or disability,^{5,9,15} more direct measures should be evaluated.

The clinician should identify which specific activities of daily living, job demands, or sports and recreational activities are the primary sources of biomechanical overload in the locomotor system. History and examination are necessary to arrive at a "functional diagnosis." Activity intolerance questionnaires (i.e., Oswestry), the history of aggravating factors, and tests of "real-world" functional tasks (squatting, lunging, balancing, loaded reaches, etc.) are used.¹³ This "functional diagnosis" can be combined with the patient's structural diagnosis (i.e., pain generator) to guide the clinician in selecting what treatments are most effective in patient care. For instance, a patient with a structural diagnosis of a herniated disc; a functional diagnosis of pain with prolonged sitting; and an inability to perform a forward lunge without flexing the trunk and hip will require training that facilitates lunging and kneeling, while maintaining the lumbar lordosis (see **Fig. 2**).



A simple screen for functional performance ability of the lower quarter is to have your patient perform a single leg squat. Compare one side to the other, looking for asymmetry of depth; Trendelenberg's sign; hip flexion; tibial torsion; or hyperpronation (see **Fig. 3**).



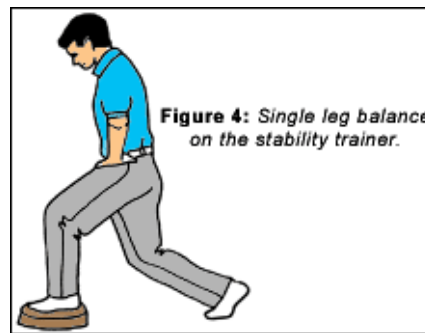
Training

The simplest way to determine if manipulation has adequately rehabilitated function is to perform posttreatment checks of relevant functional deficits. If function is not restored, functional training is indicated. There are two basic principles to follow when prescribing a new exercise. The first is the McKenzie principle: Movement should centralize, rather than peripheralize symptoms.⁸ Second (a cognitive-behavioral principle): Hurt does not necessarily equal harm.³ The patient should be informed that light activity won't injure him, and that deconditioned tissues are typically uncomfortable to move because they are stiff.

A simple way for the patient to begin functional training is in the single-leg-stance balance position. Start with the eyes open and attempt to perform a 10-second hold. Six repetitions twice a day are the goal. When this can be accomplished, progress to performing it with your eyes closed. The next progression is to

balance on one foot on the stability trainer (see **Figure 4**). Again, perform it first with eyes open; once mastered, perform it with your eyes closed.

Always progress to the next level of exercise when six repetitions (with a 10-second hold per repetition) are achieved.



A simple progression is to perform a dynamic lunge exercise, first on the floor, and then on the stability trainer (see **Fig. 5**). These exercises are performed repetitively in each different direction on the **star matrix** diagram (front, side, and back), which optimizes function (i.e., decreases hyperpronation). When 12 repetitions can be performed slowly without jerky movements, progress onto lunging with the stability trainer.



Another challenging functional exercise is the single leg squat. It is usually very difficult for a patient to perform this while balancing, so it is modified by placing the fingertips on a wall (see **Fig. 6**). This should also be performed first with eyes open, until 12 slow repetitions can be controlled, then one can progress to

"eyes closed." Then, repetitions with both eyes open and closed can be performed on the stability trainer.



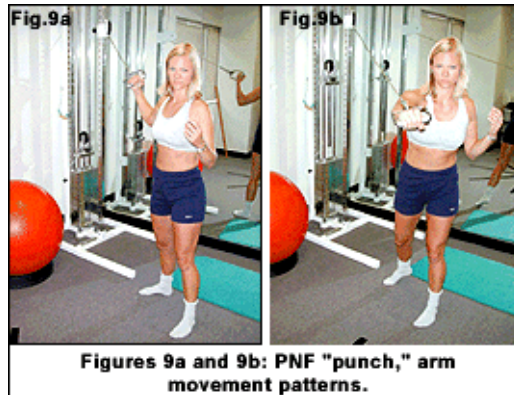
Lunges and single-leg squats can become tri-planar exercises (movement in all three planes of motion) by adding arm reaches. The correct arm motion will even improve squat or lunge performance, and should be searched for when a patient has difficulty with functional movement. For instance, if a person's forward lunge occurs with a great deal of hip or trunk flexion, asking him to raise the arms overhead will automatically drive extension (see **Fig. 7**). If hyperpronation is present, an arm reach across the body, along with an oblique or lateral lunge, will automatically facilitate supination (see **Figure 8**).





Figure 8: Lateral lunge with arm reach.

Other arm movements, like punches, or proprioceptive neuromuscular facilitation (PNF) patterns such as the "sword" or "seatbelt," can also be used (see **Figures 9 and 10**). Bands or cables are the only equipment required.



Figures 9a and 9b: PNF "punch," arm movement patterns.

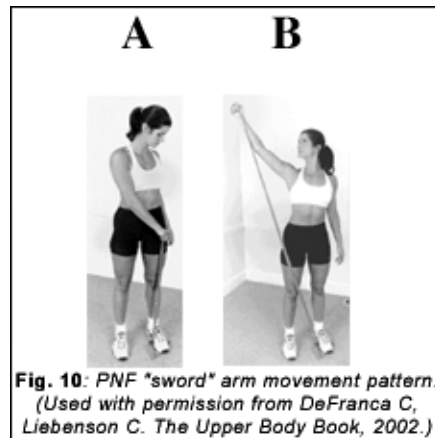


Fig. 10: PNF "sword" arm movement pattern.
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The final common pathway for functional exercises are movements that mimic the sports or activities an individual performs. The stability trainer is ideal for challenging balance, coordination, strength and endurance in these functional positions and movements (see **Fig. 11**).

Summary

Functional stability training is the final goal of rehabilitation. Yet, manipulation and nonweightbearing exercises do not necessarily need to precede more functional upright training. As the saying goes, "**Begin with the end in mind.**" By incorporating functional whole body movements and balance training, the deep core muscles can be trained. This will promote joint stability and prevent injury.

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