
Commentary

The concept of practicing skills under unusual loaded conditions is not unprecedented. Situations in which increased loads are used include the batter warming up with a weighted bat, the runner wearing a weighted vest or holding hand weights, and the sprinter charging up steps. Decreased loads are usually relegated to individuals with injuries; for example, the power lifter working out with only the bar, the runner avoiding hills, and the physical therapy patient exercising in water. Gait, in particular, was practiced by many of us in an unloaded state through time spent in a baby walker.

One of the concerns of performing motor skills under nonstandard loads is that inappropriate motor patterns may develop. Some dedicated sprinters refuse to slowly run long distances because they are convinced that this practice will make them slower runners. If a karate student practices a block thousands of times, but in slow motion, will that technique be successful in deflecting a full-speed assault? Proponents of isokinetic dynamometers insist that proper speed is vital during rehabilitation.

Gait is a particularly complex motor pattern dependent on neurological control, which may be disturbed by traumatic and pathological events. Physical therapists are often faced with the task of helping patients redevelop gait function while avoiding inappropriate gait patterns. Finch and colleagues have proposed that the more normal a gait pattern utilized during training, the more normal a gait pattern will result after rehabilitation is over. Of particular concern is that patients with neurological deficits walking with inadvertently abnormal gait patterns may take longer to recover gait function and may retain inappropriate gait patterns over a long period of time.

"Patients" with artificially induced neurological deficits in the form of spinal cats have been shown to regain near-normal gait patterns when walking with unloaded limbs. For this reason, the authors believe that human patients with neurological deficits may benefit from practicing gait under unloaded conditions. Previous work by these authors and colleagues have examined gait patterns in a limited number of patients with neurological deficits. These patients demonstrated improved gait patterns when walking under partially unloaded conditions.

Part of the difficulty with interpreting the results of gait studies (and evaluating gait, in general) is defining what is meant by "normal" gait. Many therapists would avoid defining normalcy in scientific terms, but would claim they "know it when they see it." This claim has not been supported by scientific studies. The challenge faced
by the scientist is to describe a number of quantifiable variables that can be used to characterize this motor skill. Gait consists of cyclical movement of a large number of joints, and this joint movement requires synchronization of action from many muscles. Both force output and timing are important. At the same time, infinite variations of these muscle actions may be possible to still achieve successful ambulation with the human structure. Clearly, a range of values must be used to define a normal gait pattern.6-8

Finch and colleagues have begun the task of establishing some values to represent partially unloaded gait in subjects without neurological disorders. These values could then provide a framework for comparison when the gait patterns of patients are studied. Although I am confident that these researchers will continue in their efforts to quantify both normal and pathological gait patterns, I would like to encourage others to join in these efforts. There are enough variations in gait patterns to keep many biomechanics laboratories busy for many years.

Weight unloading has added another source of variation in gait studies. Consider the differences between unloading by removing weight and unloading by decreasing the effect of gravity. During unloading by removal of weight, as demonstrated in this study, ground contact forces and associated reflexes are decreased, but airborne accelerations and decelerations are much less affected. These authors used a fairly rigid support system.9 Possible variations that could be studied include freely translating counter-weight support and incorporation of elastic elements in the support frame. Unloading by decreasing gravitational effects would include underwater walking. Of course, viscous resistance would then become an important factor. More fancifully, gait studies might be relegated to the space-shuttle bay or a future space station for an unqualified decrease in gravity.

The authors are to be congratulated for initiating investigations into an interesting, and hopefully fruitful, avenue for functional rehabilitation of patients with neurological deficits. Their rationale makes sense, and the early results are encouraging. Perhaps others who are involved in gait and neurological research will join in these efforts. 

References


