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FORM FOLLOWS FUNCTION

By Chuck Wolf, MS

From the pioneer days of fitness and sport performance, weight rooms, health clubs, and gymnasiums have been the sight of wondrous feats. As the fitness and sports enhancement industry has ventured ever closer in alliance with the rehabilitation sector, more people make the commitment to performance enhancement.

Performance enhancement becomes relative terminology to the performing individual. Whether an elite or developmental athlete, weekend warrior, recreational sports enthusiast, dancer, rehabilitating patient, or housewife, all must perform with enhanced capabilities to meet daily challenges of life. With our desires to excel, millions of people seek health clubs, corporate and community fitness centers, rehabilitation centers, strength and conditioning specialists, and personal trainers. Each goal is individual, yet possesses a similar theme – peak performance. At each of these facilities, marvelous work is accomplished to assist the performer to meet those goals. Volumes of research verify new techniques, equipment, and protocols to benefit greater outcomes. But through these endeavors, we invariably forget one important component: incorporating true function into our processes.

Traditional Methods of Training

Isolated Movements

The kinetic chain is characterized as the deceleration at one joint and the acceleration at the next joint in the chain. Too many exercises are isolated and not integrated into the kinetic chain. For example, a leg extension exercise isolates the knee joint and breaks the kinetic chain. The isolation of the knee joint from the subtalar, ankle, and hip joints reduces functional movement. Additionally, joint isolation increases torque and injury vulnerability to that joint. The chain is only as strong as its weakest link, and there are moments when joint isolation is required. I am not advocating elimination of joint isolation movements; rather, include integrated movements that require full kinetic chain recruitment and synchronization resulting in eventual improved function.

Functional movement involves the synchronization of the opening and closing of the kinetic chain. The issue is not performing open kinetic chain or closed kinetic chain activities, but to incorporate both forms of movement into an exercise for the sole purpose to enhance movement. Function needs to include actions requiring force reduction, stabilization (balance), and force production. Additionally, functional movement necessitates the involvement of the entire kinetic chain, not the breaking of the chain thereby reducing the functional effectiveness of the movement.

Movements are Primarily Force Production in Nature

The exercises in most strength and conditioning programs require force production movements and not force reduction activities. We hear trainers reminding their performers to “do the negatives” or “don’t forget the eccentric contraction” during a session. Yes, the eccentric phase of contraction is important but is done in isolation, not integrated into complex movements. Movement along the transverse plane is performed perpendicular to gravity, requires pronation (eccentric or pre-load) or deceleration along the rotational path, and supination (concentric or afterload) along the functional, rotational path. In the transverse plane, the transition from deceleration or force reduction to acceleration or force production must go through stabilization or balance. Isolated, non-integrated movements do not require the performer to move through the entire kinetic chain stabilization phase.

Isolated Movements Do Not Promote Stabilization/Balance

Balance is related to agility and coordination. The connotation of balance is a passive mode by which we maintain a position. However, balance is a dynamic coordination of intricate sensitivities recruiting our visual, vestibular, musculoskeletal systems and kinesthetic awareness. Gary Gray, PT, and Vern Gambetta, MA, describe functional balance as “the control of one’s center of gravity, body angles, and unstable equilibrium. It is the interplay of imbalance and balance with the body.” In basic terms, as performers move, they are in a constant state of losing balance and attempting to regain it. Gray and Gambetta continue to characterize balance as “Inner Zone” balance - the body’s own weight and center of gravity - and “Outer Zone” balance - how far outside you can reach or stand and still regain your balance or position. Isolated movements do not promote balance, particularly if the position does not recruit action originating in the subtalar joint. To create balance, the performer must go through subtalar neutral. If this component is not integrated into the exercise movement, it is not truly functional. To have balance, the performer must possess the ability to create motion with pronation, and this cannot be attained without passing through the subtalar neutral position.

Movements Are Not Tri-Planar

The majority of excellent training programs are performed on the sagittal and frontal planes, yet neglect the transverse plane –the functional plane. Living in the real world requires three dimensions. The truly functional movements and activities of daily living center around the transverse plane; however, most of the exercise selections concentrate on the sagittal and frontal plane: i.e. curls, abdominal curls, isolated leg exercises. I am not suggesting trainers, strength and conditioning coaches, or therapists disavow exercises from those planes, but to incorporate the transverse plane into the training program. The incorporation of the transverse plane into exercise involves curvilinear movement and rotation. Most sagittal and frontal plane actions are curvilinear but not rotational. In the transverse plane the upright position is perpendicular to gravity and must allow the performer to engage through force reduction (pronation), stabilization (balance through the subtalar neutral position), and force production (supination). The transverse plane actions include open and closed chain movements. Pronation (pre-loading or eccentric loading) and supination (after-loading or concentric loading) occur through the rotational segments of the subtalar joint, knee,

and hip. Additionally, trainers, therapists, and coaches break the kinetic chain by having the performer seated during many activities, thereby breaking the kinetic chain.

Functional Training

Functional Balance

Functional balance plays an integral role in performance. Performance suffers without functional balance. The enhancement of functional balance must include actions that require force reduction, stabilization, and force production. The rebounding athlete, rotating dancer, gymnast, and cyclist constantly adjust their functional balance to perform and to have a keen awareness of their body in motion and space. Balance goes beyond standing on one foot or with feet close together. Rather, it recruits the nervous and visual systems, and proprioception while in motion.

Balance requires the stabilization musculature from the subtalar joint, the gluteals, abdominals, erector spinae, up through the cervical spine. The performer must challenge each of those systems through manipulation of body angles, visual changes, cervical rotation, intrinsic and extrinsic weight adjustments. Each subtle adjustment and the combination of these adjustments will lead the performer to increased kinesthesia and enhanced functional balance. When these adjustments are combined with dynamic activity, the environment is created to require the performer to slow, stop, or change direction thereby needing to reduce force in one direction, stabilize, and produce force in another direction. By performing these activities in the transverse plane, the individual must now recruit ankle, knee, and hip stabilizers while pronating and then supinating during rotation. Subtalar and ankle stabilizers, strong hip stabilizers and internal and external obliques work in tandem to decrease the rotational forces when a performer must suddenly stop and pivot. This can assist the stability of the hip to knee relationship and thereby work to prevent the hip from continuing to rotate while the knee and ankle are fixed and the foot planted. This form of training appears to produce positive effects in reducing risk of ankle and knee injuries.

When functional, transverse plane activities are utilized, the performer is not only gaining strength and function, but also recruiting the use of the visual, vestibular, and somatic senses required for optimal performance. Functional training should include change of body angle, closing one or both eyes, and cervical rotation to challenge the visual, vestibular, and proprioception systems to enhance balance and kinesthesia. These systems function at higher acuity in the transverse plane.

Functional Activity Programming

The article is ***not*** suggesting the abandonment of a myriad of program designs, training techniques, or theories that have positive results. The message in this article is to consider incorporating these concepts to create truly functional programs that can enhance power, strength, performance, balance, reduce risk of injury, and improve quality of life. The same concepts apply in the rehabilitation setting, athletic environment, preventive program, or working with the senior population. The body innately functions the same whether recovering from injury, attempting to gain greater

function, or improve overall function and performance. A major component during the injury recovery process is to regain strength, stability, and proprioception. The above principles can be applied as part of a rehabilitation program with moderation and toleration. The movements do not have to be as large or dynamic in the rehabilitation or frail populations; however, the goal of strength, stabilization, and function are all relative to the performer we are working with.

Functional, efficient training activities should consider the following issues:

- Include integrated open and closed chain movements
- Analyze the planes of movement and be sure to encompass tri-planar movements
- Engage in functional core stabilization exercise. Integrate the subtalar, knee, hip, and thoracic regions in a weight bearing position to be considered truly functional.
- Challenge the performer's balance by constantly adjusting the center of gravity and/or body angles.
- Challenge the vestibular, visual, and proprioceptor systems.
- Apply specificity to the performer's activity and life style.

Our industry is not an exact science. Many of the best theories and protocols are derived from the exchange of ideas. We must be open to rational change to expand our horizons and the care for the all the performers we come in contact with and affect.



References

- Gray, Gary W. Chain Reaction Festival, Wynn Marketing, 1996
- Gray, Gary W. Lower Extremity Functional Profile, Wynn Marketing, 1995
- "Restoring the Balance", G. Metz, T & C, April, '99
- "The Agony of the Feet", M. Forgrave, T & C, December '99
- "Hyperpronation and ACL Injury: How Strong is the Link", P. Edwards, Jr., M.D., Biomechanics, October'97
- "Force and Function", V. Gambetta, T & C, July/August, '99
- "Twists and Turns", D. Cipriani, T & C, December, '99
- "Functional Balance", G. Gray and V. Gambetta, www
- "Following the functional Path", G. Gray and V. Gambetta, www
- "Hip Stability Influences Lower Extremity Kinematics, R. Hruska, PT, Biomechanics, June, '98
- "Forefoot Focus", M. Pryce, MD, Biomechanics, June'98
- "Foot Pathology Takes an Abductory Twist", S. Gershman, DPM, Biomechanics, June'98

