Integrative Approaches to Optimum Performance

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An integrative approach to optimum performance takes into consideration structural, biochemical and psychological factors.

Optimum performance is dependant on optimum alignment. Alignment of the musculoskeletal system allows posture to be balanced with center of gravity and for the ability of the neuromuscular system to perform functional tasks with the least amount of energy and stress on the kinetic chain. In addition, it allows for optimum muscle length-tension relationships at which muscles are capable of developing maximal tension

In order to appreciate the impact of optimum alignment, it is necessary to understand the kinetic chain.

The kinetic chain has three interrelated components:

1. Myofascial
2. Neural
3. Articular

The myofascial component functions optimally when length tension relationships are balanced. Many injuries and in some instances performance detriments are due to a combination of overactive and underactive muscles, which leads to distorted movement patterns, pain, and injury.

The nervous systems functions to coordinate movements between muscles. This synergistic activity allows for force-couple relationships between muscles, facilitating optimum muscle recruitment. When force couple relationships are dysfunctional, synergistic muscles become dominant, resulting in muscle imbalance, pain and injury.

The articular system, is made up of joints. Normal joint motion is dependant upon optimum length-tension relationships (myofascial) and force-couple relationships.

In order for performance to occur optimally, it is essential that the entire kinetic chain is in balance. Any weaknesses or asymmetries can affect performance and potentially result in injuries or postural distortion patterns.

Distorted posture is often the result of altered reciprocal Inhibition**,** the process whereby a tight or overactive agonist inhibits its functional antagonist e.g. a tight psoas (hip flexor) resulting in a weak gluteus maximus (hip extensor). In addition, these asymmetries result in altered force couple relationships and synergistic dominance resulting in the development of faulty movement patterns and poor neuromuscular control e.g. a weak gluteus maximus results in overactive hamstrings, tensor fascia latae and erector spinae muscles. Abnormal movement results in joint dysfunction, muscle inhibition, proprioception disturbance and myofascial trigger points. The end result is tissue overload, decreased neuromuscular efficiency and injury

The following is an example of kinetic chain dysfunction and how it can affect the entire body:
Excessive pronation at the feet causes excessive tension in tibialis posterior and peroneous longus muscles. This can lead to knee stress and lateral thigh tension, and result in tight hamstrings, IT band, and tensor fascia latae. Abnormal tension in these muscles can disrupt normal lumbo-pelvic rhythm, causing anterior pelvis rotation and an increased lumbar lordosis. An increased lumbar lordosis can cause tight psoas, erector spinae and latissimus dorsi muscles, resulting in downward traction of the scapula and excessive tension in outer shoulder muscles, resulting in shoulder and neck pain.

The traditional biomechanical view of the body is morphologically oriented, i.e. is uniplanar and views joints in isolation. An integrative functional approach focuses on all kinetic chain components (myofascial, articular and neural) as well as viewing the entire chain. This approach is very effective in uncovering the cause of chronic injuries as well as designing training programs to maximize performance.

An integrative approach to optimum performance starts with evaluating the kinetic chain. This can be done both statically through visual inspection and dynamically through observing movements such as gait, an overhead squat and range of motion at each joint. Additional information can be gained through joint and muscle palpation.

After an assessment is performed, a program can be designed to address specific imbalances. This can include manual therapies such as trigger point therapy, soft tissue manipulation or joint mobilization and/or corrective exercise.

The goal of treatment is:
1. Control the pain and break the pain cycle
2. Break chemical and Mechanical feedback loop that maintains muscle contraction
3. Increase circulation that has been restricted by contracted tissue
4. Lengthen shortened muscles
5. Reconditioning and strengthening weak muscles
6. Correct movement patterns
7. Prevention of recurrence through exercise

Corrective exercise consists of:
1. Inhibiting tight muscles e.g. self myofascial release with foam rollers
2. Lengthening muscle through stretching
3. Activating weak muscles through isolated strengthening
4. Integrating movement patterns with compound functional exercises

Once imbalances are corrected, exercise should progress As follows:
1. Stabilization/core

2. Strength and hypertrophy
3. Power

Functional exercise should have the following characteristics:

1. Multiplanar (sagittal, transverse, frontal)
2. Involves acceleration, deceleration and stabilization
3. Multiple speeds
4. Varying body positions
5. Optimum alignment
6. Periodization
7. Recovery and regeneration

Biochemical factors affecting performance have to do with diet and nutrition. Nutrition is important both for energy as well as repair. What and when an athlete eats is essential for performance enhancement as general health.

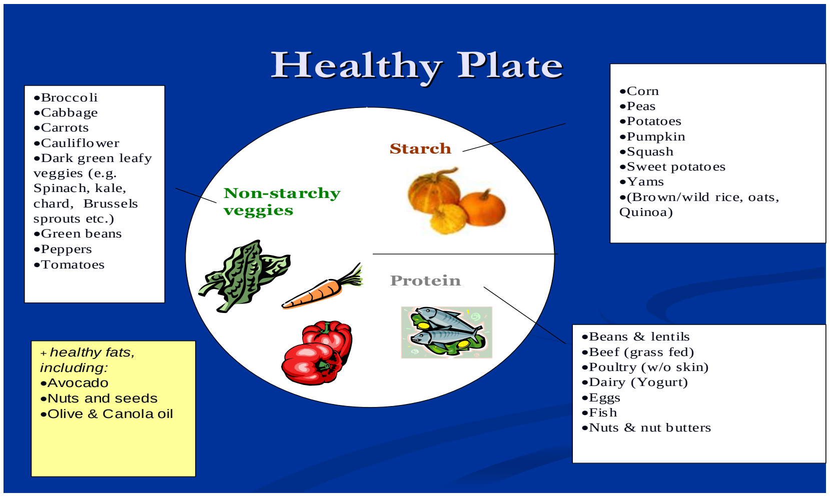
The Basics:
Carbohydrates, proteins and fats provide the energy necessary to maintain body functions at rest and during activity.

Carbohydrates primarily come from vegetables, fruits, legumes and grains. Carbohydrates can be classified according to how they affect one's blood sugar. A high glycemic carbohydrate (e.g. refined cereal, Gatorade) will lead to a rapid increase in blood sugar whereas a low glycemic carbohydrate (e.g. yogurt, legumes) has more of a stabilizing effect on blood sugar. Carbohydrates are responsible for energy, fat metabolism and sparing muscle protein. The type of carbohydrates an athlete should consume depends on the energy requirement of the sport. Sports with greater intensity rely on carbohydrates as the primary source of fuel. Generally, for endurance activities, athletes should eat low glycemic carbohydrates the night before an event and higher glycemic load carbohydrates during and after an event, in order to maintain energy stores and facilitate recovery.

Protein is found both in animals and plants. Animal proteins are classified as being "complete" and as such are optimal in terms of repair and recovery. Protein functions as part of our immune system, hormones and fuel when muscle glycogen (carbohydrate) is depleted. Protein is especially important for repair as well as stabilizing blood sugar levels. For events greater than 90 minutes, the body will breakdown protein (gluconeogenesis) if glycogen is depleted and not replaced during an event with low glycemic foods.

Fats or lipids, are found in both and animals and plants. They are classified according to their chemical make-up or degree of saturation. Fat is the most energy dense nutrient. It is an ideal fuel source for lower intensity or endurance activities. Other functions include: nerve transmission, vitamin transport and organ cushioning. Research shows that optimum health can be achieved by a diet higher in omega 3 fats e.g. cold water fish and monounsaturated fats such as olive oil. This author recommends using extra virgin olive oil for salad dressing and low heat cooking and canola oil for moderate heat cooking. Avoiding trans fats is important for general health. Many popular snacks contain a combination of these bad fats, sugar and artificial ingredients, which are poor choices for recovery and repair and are major causes of obesity and other chronic health conditions.

In general, it is recommended that athletes consume approximately 55% carbohydrates, 30% fat and 15% protein of their total caloric intake. The healthy plate is a good guideline:



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Recommendations:
The following are recommendations of what and when to eat in order to meet the specific demands of an endurance event, as well as providing optimal nutrition for performance and health. It is important to understand that pre-game, game and post game nutrition are all important and have slightly different nutritional requirements:

Emphasize whole foods (preferably local, seasonal and if possible organic)
Pre-exercise nutrition should be 4-6 hours before practice/game and should consist primarily of low glycemic sources. If a game is in the early morning, then dinner the prior night should meet these criteria. Pre-exercise nutrition is important for maximizing glycogen (carbohydrate) storage in muscle. An additional snack is recommended 30-60 minutes prior to the practice/game
Moderate-high glycemic foods should be consumed every 20 minutes during exercise to reduce muscle protein breakdown.

Moderate-high glycemic foods are also the foods of choice after exercise and should be consumed within 30 minutes after a practice/game in order to minimize muscle catabolism (breakdown) and maintain anabolic state. This helps to support recovery and immune function

A post exercise meal 1-2 hours after practice/game should consist primarily of low glycemic sources.

Staying hydrated throughout the day and especially before/during/after games and practices is essential. For activities under 90 minutes, water is the best choice. Vitamin drinks and other colorful concoctions are superfluous and often unhealthy due to the artificial ingredients

Example of Pre-exercise meal:

*Dinner the night before- enriched Barilla pasta with turkey meat sauce a mixed salad. Oatmeal/Berry crisp for desert

*Breakfast that morning- Oatmeal with nuts, raisons, berries and cinnamon. Smoothie (milk/whey protein-15g/1/2 banana/1 tbsp nut butter)

Example of Pre-exercise snack:

*Nut butter and honey on multi-grain bread

*Smoothie (see above)

*Cheese and high fiber crackers

Example of what to eat during a practice/game:

*Blend 8 oz orange juice with ½ banana 1 scoop whey protein and water (16 oz total). This should be consumed during breaks and at half time. This should not replace water

Example of immediate post-exercise nutrition:

*Peanut butter and honey or mozzarella cheese sandwich on high fiber bread and a piece of fruit.

Example of post exercise meal:

*Brown rice, beans, chicken, guacamole and salsa

*Pasta with meat sauce and a salad

*Tuna or turkey sandwich with veggies and 1 fruit

Naturopathic Approaches to Inflammation

- Antioxidants: A, E, C, Se, Zn, CoQ10
- C/Bioflavonoids- 1000mg 3x/day
- Magnesium (citrate)- 300mg 2x/day
- Fish Oil (18% EPA & 12%DHA)- 10g per day (at least 3g EPA)
- Bromelain- 1000-2000 MCU 4x/day away from food
- Quercetin- 500mg 3x/day
- Boswellia- 400mg 3x/day
- Glucosamine and Chondroitin Sulphate- 500mg of each 3x/day
- Topical DMSO
- Topical Biofreeze
- Hydrotherapy

- Guided imagery/systematic relaxation/hypsosis

Dietary Factors in Inflammation

- Phytonutrients- vegetables and fruits
- Green/Black tea
- Garlic, Ginger, Turmeric, Cinnamon etc.
- Consume low glycemic load carbohydrates (insulin connection)
- Eat small frequent meals to ensure glycemic regulation
- Omega 6:Omega 3 should be <4:1
- Decrease meat, dairy, shellfish and refined carbohydrates/fats
- Decrease caffeine and alcohol
- Optimize digestion and bowel habits
- Identify food reactions

Lastly, addressing the psychological aspect of performance consists of stress modification and mind-body integration techniques, such as self-hypnosis and guided imagery.

Hypnosis/Guided Imagery

- Applied imagination
- Hypnosis changes your expectations about how intense the pain will be
- The process activates certain parts of the brain, including the portion that focuses attention. "By concentrating elsewhere, a person inhibits the pain from coming to conscious awareness
- Reduced activity the primary sensory cortex and increased activity in other areas of the brain
- increased activation in the left anterior cingulate cortex and the basal ganglia- part of an inhibition pathway that blocks the pain signal from reaching the higher cortical structures responsible for pain perception