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THE WAY OF REFILLING THE ENERGY AFTER WORKOUT/RUNNING

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ABSTRACT

Ask any runner about how to fuel during long runs, and you'll hear a variety of opinions: "Drink sports drinks; they make it easier to stay hydrated." "Don't drinks sport drinks; they're full of artificial colors." "Gels are a perfect fuelling choice." "Gels are too hard to get down." "You should eat real food." "You don't really need to eat at all." Sound familiar? Here's the actual deal: Fuelling is important during long runs, but your choice of what to fuel with lends itself to flexibility. You'll no doubt see a majority of athletes fuelling with gels, blocks, sports drinks, or other commercial products. But you can also try fuelling with "real foods"—meaning foods that you can buy from the grocery store that aren't necessarily made for sports nutrition.

Keywords: Running, Sports Drinks, Hydrated, Nutrition, Foot strike.

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INTRODUCTION:

Overview:

Running gait can be divided into two phases in regard to the lower extremity: stance and swing. These can be further divided into absorption, propulsion, initial swing and terminal swing. Due to the continuous nature of running gait, no certain point is assumed to be the beginning. However, for simplicity, it will be assumed that absorption and foot strike mark the beginning of the running cycle in a body already in motion.

Foot strike:

Foot strike occurs when a plantar portion of the foot makes initial contact with the ground. Common foot strike types include forefoot, midfoot and heel strike types. These are characterized by initial contact of the ball of the foot, ball and heel of the foot simultaneously and heel of the foot respectively. During this time the hip joint is undergoing extension from being in maximal flexion from the previous swing phase. For proper force absorption, the knee joint should be flexed upon foot strike and the ankle should be slightly in front of the body. Foot strike begins the absorption phase as forces from initial contact are attenuated throughout the lower extremity. Absorption of forces continues as the body moves from foot strike to midstance due to vertical propulsion from the toe-off during a previous gait cycle.[1]

Midstance:

Midstance is defined as the time at which the lower extremity limb of focus is in knee flexion directly underneath the trunk, pelvis and hips. It is at this point that propulsion begins to occur as the hips undergo hip extension, the knee joint undergoes extension and the ankle undergoes plantar flexion. Propulsion continues until the leg is extended behind the body and toe off occurs. This involves maximal hip extension, knee extension and plantar flexion for the subject, resulting in

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the body being pushed forward from this motion and the ankle/foot leaves the ground as initial swing begins.

Propulsion phase:

Most recent research, particularly regarding the foot strike debate, has focused solely on the absorption phases for injury identification and prevention purposes. The propulsion phase of running involves the movement beginning at midstance until toe off. From a full stride length model however, components of the terminal swing and foot strike can aid in propulsion. Set up for propulsion begins at the end of terminal swing as the hip joint flexes, creating the maximal range of motion for the hip extensors to accelerate through and produce force. As the hip extensors change from respiratory inhibitors to primary muscle movers, the lower extremity is brought back toward the ground, although aided greatly by the stretch reflex and gravity. Foot strike and absorption phases occur next with two types of outcomes. This phase can be only a continuation of momentum from the stretch reflex reaction to hip flexion, gravity and light hip extension with a heel strike, which does little to provide force absorption through the ankle joint. With a mid/forefoot strike, loading of the gastro-soleus complex from shock absorption will serve to aid in plantar flexion from midstance to toe-off. As the lower extremity enters midstance, true propulsion begins. The hip extensors continue contracting along with help from the acceleration of gravity and the stretch reflex left over from maximal hip flexion during the terminal swing phase. Hip extension pulls the ground underneath the body, thereby pulling the runner forward. During midstance, the knee should be in some degree of knee flexion due to elastic loading from the absorption and foot strike phases to preserve forward momentum. The ankle joint is in dorsiflexion at this point underneath the body, either elastically loaded from a mid/forefoot strike or preparing for stand-alone concentric plantar flexion. All three joints perform the final propulsive movements during toe-off. The plantar flexors plantar flex, pushing off from the ground and returning from dorsiflexion in midstance. This can either occur by releasing the elastic load from an earlier mid/forefoot strike or concentrically contracting from a heel strike. With a forefoot strike, both the ankle and knee joints will release their stored elastic energy from the foot strike/absorption phase. The quadriceps group/knee extensors go into full knee extension, pushing the body off of the ground. At the same time, the knee flexors and stretch reflex pull the knee back into flexion, adding to a pulling motion on the ground and beginning the initial swing phase. The hip extensors extend to maximum, adding the forces pulling and pushing off of the ground. The movement and momentum generated by the hip extensors also contributes to knee flexion and the beginning of the initial swing phase.

Swing phase:

Initial swing is the response of both stretch reflexes and concentric movements to the propulsion movements of the body. Hip flexion and knee flexion occur beginning the return of the limb to the starting position and setting up for another foot strike. Initial swing ends at midswing, when the limb is again directly underneath the trunk, pelvis and hip with the knee joint flexed and hip flexion continuing. Terminal swing then begins as hip flexion continues to the point of activation of the stretch reflex of the hip extensors. The knee begins to extend slightly as it swings to the anterior portion of the body. The foot then makes contact with the ground with foot strike, completing the running cycle of one side of the lower extremity. Each limb of the lower extremity works opposite to the other. When one side is in toe-off/propulsion, the other hand is in the swing/recovery phase preparing for foot strike. Following toe-off and the beginning of the initial swing of one side, there is a flight phase where neither extremity is in contact with the ground due to the opposite side finishing terminal swing. As the foot strike of the one hand occurs, initial swing continues. The opposing limbs meet with one in midstance and midswing, beginning the propulsion and terminal swing phases.

Upper extremity function:

Upper extremity function serves mainly in providing balance in conjunction with the opposing side of the lower extremity. The movement of each leg is paired with the opposite arm which serves to counterbalance the body, particularly during the stance phase. The arms move most effectively (as seen in elite athletes) with the elbow joint at an approximately 90 degrees or less, the hands swinging from the hips up to mid chest level with the opposite leg, the Humerus moving from being parallel with the trunk to approximately 45 degrees shoulder extension (never passing the trunk in flexion) and with as little movement in the transverse plane as possible. The trunk also rotates in conjunction with arm swing. It mainly serves as a balance point from which the limbs are anchored. Thus, trunk motion should remain mostly stable with little motion except for slight rotation as excessive movement would contribute to transverse motion and wasted energy. Foot strike debate: Recent research into various forms of running has focused on the differences, in the potential injury risks and shock absorption capabilities between heel and mid/forefoot foot strikes. It has been shown that heel striking is generally associated with higher rates of injury and impact due to inefficient shock absorption and inefficient biomechanical compensations for these forces. This is due to forces from a heel strike traveling through bones for shock absorption rather than being absorbed by muscles. Since bones cannot disperse forces easily, the forces are transmitted to other parts of

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the body, including ligaments, joints and bones in the rest of the lower extremity all the way up to the lower back. This causes the body to use abnormal compensatory motions in an attempt to avoid serious bone injuries. These compensations include internal rotation of the tibia, knee and hip joints. Excessive amounts of compensation over time have been linked to higher risk of injuries in those joints as well as the muscles involved in those motions. Conversely, a mid/forefoot strike has been associated with greater efficiency and lower injury risk due to the triceps surge being used as a lever system to absorb forces with the muscles eccentrically rather than through the bone. Landing with a mid/forefoot strike has also been shown to not only properly attenuate shock but allows the triceps sure to aid in propulsion via reflexive plantar flexion after stretching to absorb ground contact forces. Thus, a mid/forefoot strike may aid in propulsion. However, even among elite athletes there are variations in self-selected foot strike types. This is especially true in longer distance events, where there is a prevalence of heel strikers. There does tend however to be a greater percentage of mid/forefoot striking runners in the elite fields, particularly in the faster racers and the winning individuals or groups. While one could attribute the faster speeds of elite runners compared to recreational runners with similar foot strikes to physiological differences, the hip and joints have been left out of the equation for proper propulsion. This brings up the question as to how heel striking elite distance runners are able to keep up such high paces with a supposedly inefficient and injurious foot strike technique. Stride length, hip and knee function: Biomechanical factors associated with elite runners include increased hip function, use and stride length over recreational runners. An increase in running speeds causes increased ground reaction forces and elite distance runners must compensate for this to maintain their pace over long distances. These forces are attenuated through increased stride length via increased hip flexion and extension through decreased ground contact time and more force being used in propulsion. With increased propulsion in the horizontal plane, less impact occurs from decreased force in the vertical plane. Increased hip flexion allows for increased use of the hip extensors through midstance and toe-off, allowing for more force production. The difference even between world-class and national-level 1500-m runners has been associated with more efficient hip joint function. The increase in velocity likely comes from the increased range of motion in hip flexion and extension, allowing for greater acceleration and velocity. The hip extensors and hip extension have been linked to more powerful knee extension during toe-off, which contributes to propulsion. Stride length must be properly increased with some degree of knee flexion maintained through the terminal swing phases, as excessive knee extension during this phase along with foot strike has been associated with higher impact forces due to braking and an increased prevalence of heel striking. Elite runners tend to exhibit some degree of knee flexion at foot strike and midstance, which first serves to eccentrically absorb impact forces in the quadriceps muscle group. Secondly it allows for the knee joint to concentrically contract and provides major aid in propulsion during toe-off as the quadriceps group is capable of produce large amounts of force. Recreational runners have been shown to increase stride length through increased knee extension rather than increased hip flexion as exhibited by elite runners, which serves instead to provide an intense braking motion with each step and decrease the rate and efficiency of knee extension during toe-off, slowing down speed. Knee extension however contributes to additional stride length and propulsion during toe-off and is seen more frequently in elite runners as well.

Running science parameters:

1. Running physics
2. Running economy VO_2Max[3].
3. Involves major muscles in running
4. Nutrition in running
5. Foot strike in running
6. Warm up improves muscles stiffness. Muscles stiffness is directly related to muscles injury and during warm up it increases body temperature. Stretching exercise are two types (i) dynamic exercise (ii) static stretching.[1]

(i) **Dynamic exercise** may be classified in different ways, a. movements of different joints of human body like Fingers, Wrist, Elbows, Shoulders, Neck, Trunk and shoulder blades, Hips, Knees, Ankles, Feet and toes.[2]

(ii) **Static Exercise** is more effective in cool down exercise at end of the running. These are chest stretch, upper back stretch, shoulder stretch, side bends, hamstring stretch, calf stretch, hip and thigh stretch.[3] Warm up increases the contraction and relaxation of muscles, metabolism, muscle temperature, blood flow and reduce the muscles stiffness.

Cool down exercise decreases body temperature, reduce the heart rate and remove the lactic acid.[4]

Greater economy of movement because of lowered viscous resistance within warmed muscles. Mentally focused on the training or competition and cool down exercise in running (stretching to improve mobility and range of motion, stretching is dynamic and static. Knowledge about the physics of running is of particular interest to high-level athletes who strive to optimize their performance, using a combination of expert coaching and state-of-the-art training facilities. To most people, the physics behind running is hardly given a second thought. But when

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medals, such as Olympic medals, are on the line then such thoughts become commonplace and turn into active areas of research. There has been significant research done in the past on the physics of running, and I will discuss some of the main aspects of it here. I will first talk about basic running mechanics. Forces generated during running considering the figure below showing the profile view of a runner on a flat horizontal surface. The forces are indicated.

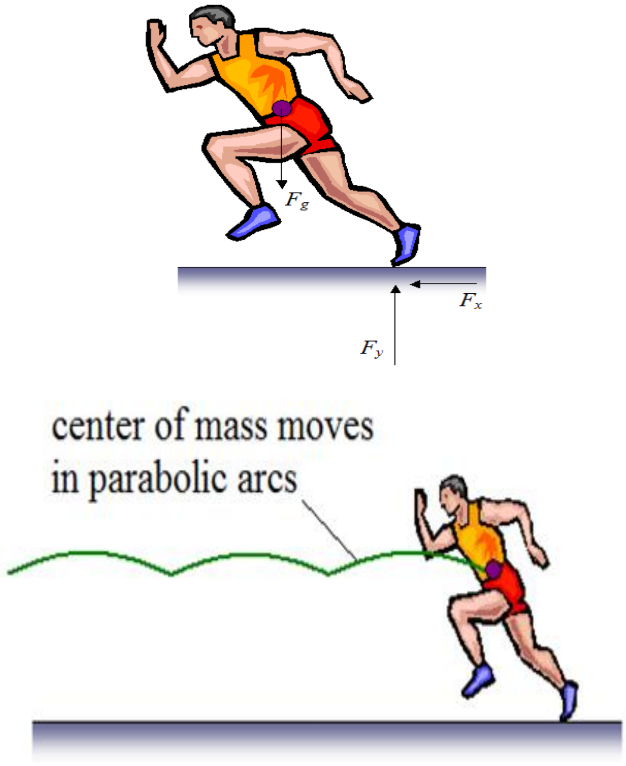

Figure 1: Running vectors

This figure shows the forces acting on a runner when he is pushing off the ground with one of his feet. The force F_x is the horizontal force due to the contact between the runner's foot and the ground, and the force F_y is the vertical force due to the contact between the runner's foot and the ground. The force F_g is the force due to gravity which pulls down on the runner. This force acts through the center of mass of the runner, represented by the purple dot. During a run the force F_y is greater than F_g in order to lift the runner off the ground as he runs. The force that drives the runner forward is the propulsive force F_x. Running speed is directly related to the magnitude of this force. An Olympic sprinter can push off the ground with a total peak force of more than 1000 pounds (with a time averaged F_x equal to about 200 pounds, which is less than the peak F_x). In contrast, the average person can apply 500-600 pounds of total peak force.[2]

The greater the force F_x, the greater the horizontal running velocity, and the longer the arc length, hence the faster the runner will run.

Arm Swinging: Arm swinging is an important part of running. It serves to stabilize the body. To illustrate this consider the figure below. To illustrate this consider the figure below.

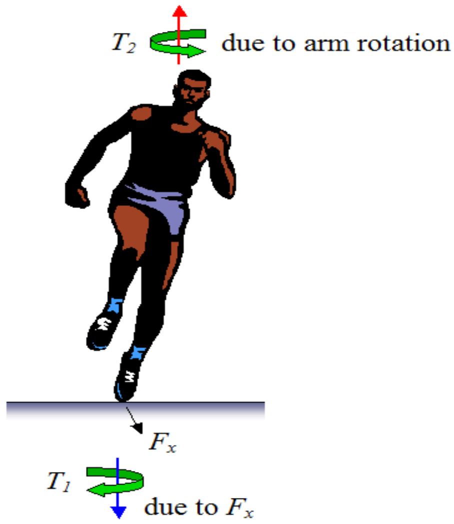

Figure 2: Arm swinging by runner to generate counter torque

As the runner's left foot strikes the ground, he pushes off with a force F_x. This force causes a torque T_1 to be exerted on his body which tends to rotate his torso in the direction shown. To correct for this rotation the runner simultaneously swings his arms in the direction shown which exerts a counter torque T_2 on his body which tends to rotate his torso in the opposite direction. The generation of this counter-torque helps keep his body stable and facing forward as he runs.

Similarly, when his right foot strikes the ground the situation reverses, and his arms must swing in the opposite direction to before to induce a corrective torque which once more helps keeps his body facing forward. Keeping your arms bent while running makes it easier to swing them. Think of a swinging pendulum. A short pendulum is easier to swing than a long pendulum, and by analogy your arms are easier to swing when they are bent. When we run, we do all this without thinking? It is a completely automatic set of movements. Let's now look at some optimal running strategies as given in the literature.

Case 1 – Optimal running strategy for short sprints less than 291 meters.[1,2]

According to an analysis given in reference [2] (and based on the physiology of record holders from 1973), the distance of 291 meters is a transition point in the optimal running strategy. For distances less than 291 meters, the runner should accelerate as fast as possible until he reaches his maximum speed. He should then maintain this speed until the end of the race. The figure below illustrates this for a typical 100 meters men's sprint:

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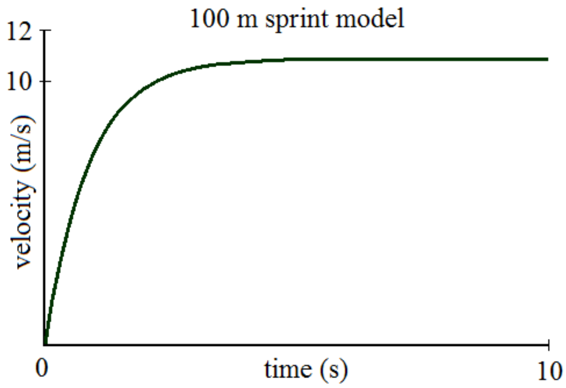

Figure 3: Graphical representation of running velocity vs time to form plateau in 100 m sprint model [4]

The mathematical equations for this optimal running strategy are given in an e-book, the details of which are described below.

Case 2 – Optimal running strategy for a race longer than 291 meters: The 400 meters.[1,2]

According to an analysis given in reference [2] (and based on the physiology of record holders from 1973), the runner should accelerate as fast as possible for 1.78 seconds. This will enable him to reach a speed near his maximum. He should then maintain this speed for as long as he can. This speed will be such that 0.86 seconds before the end of the race his energy is entirely used up, and after this point is reached his running speed will begin to drop. Clearly this would be difficult to exactly reproduce in an actual race but it does give some non-intuitive insight into how 400-meter sprinters might maximize their performance. The figure below illustrates this for a typical 400-meter men's race:

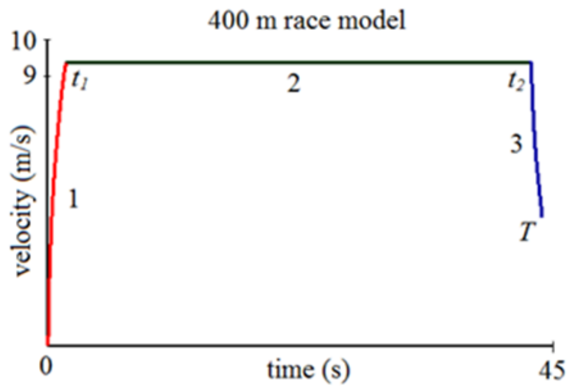

Figure 4: Graphical representation of running velocity vs time to form plateau in 400 m sprint level

Where t_1 and t_2 are intermediate times representing the start and end of the cruising (constant speed) stage. T is the time at which the race ends. Now, t_1 = 1.78 seconds, and t_2 = T − 0.86 seconds. This is based on the physiology of record holders from 1973. The numbers 1, 2, 3 represent the three stages of the race: The acceleration stage (1), the cruising stage (2), the deceleration stage (3). The mathematical equations for this optimal running strategy are given in an e-book, the details of which are described below. For races that are greater than 400 meters the strategy to use is less clear.[1] According to reference[1], "There is typically an acceleration in the later part of the race, either quickly and forcefully to defeat competitors, or gradually over the final third of the race to expend all remaining energy more evenly." In the absence of a good physical model to assist runners in their racing strategy, they must ultimately rely on "feel"; which is a combination of psychological factors based upon their positioning relative to other runners, and how their body feels as they settle into the race.

Effect of race curve on running times: Sprinting around a turn (such as for the 200 m and 400 m races) is known to result in a longer race time than if the race were run on a straight track. This is due to the centrifugal force experienced by the runner as he goes around the turn. This has the effect of diminishing the force available to the runner for propelling himself around the track. As expected, this effect is more pronounced the smaller the turn radius is. Hence, we have the common complaint by runners that the inside lane is "too tight". The figure below shows the contact forces acting between the runner's foot and the curved track. The turn radius is R.

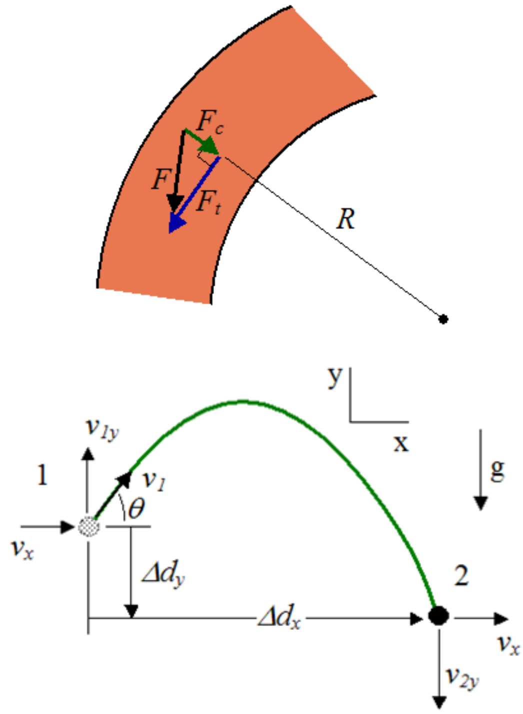

Figure 5: Body curvature in statics reciprocated to vector

This centrifugal force is in addition to the force necessary to propel him tangentially along the track, which is F_t. The total force F (exerted by the runner on the track) has components F_t and F_c. In reference [3], the authors determine that a runner in lane 1 (the innermost lane) would run the 200 m in 19.72 seconds, whereas in lane 8 (the outermost lane) he would run it in 19.60 seconds. This is a big-time difference and translates into a distance of about 1 meter at the finish line. Since many races are won

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or lost be mere centimetres, this is a very significant difference. However, it should be pointed out that sprinters do not consider lane 8 to be the most advantageous one either since, due to the staggered starts, they would run half the race ahead of the other runners which puts them in a psychological disadvantage of not being able to see what the other runners are doing.[4]

Effect of track material on running times: It is possible to lower world record running times by selecting an optimized track material. An optimized track would have a certain amount of stiffness built into it, based on the mechanical properties of the human runner. The track stiffness is much like the stiffness of a spring. And the stiffness should not be too much or too little. It must fall within an optimal range. This optimal range should be such that, during a runner's foot strike, the track efficiently absorbs energy (during the penetration stage), and releases this same amount of energy (during the rebound stage).[5]

Projectile Motion: Projectile motion describes the motion of objects, which have the force of gravity and air resistance acting on them. In many problems, air resistance is neglected in the analysis. This is done to simplify the calculations.

The figure below shows the motion of a particle, under the influence of gravity only.

Define the following variables:

Δd_x is the change in horizontal position

v_x is the horizontal velocity (constant)

t is time

Δd_y is the change in vertical position

$v1_y$ is the initial vertical velocity

g is the acceleration due to gravity, which on earth is 9.8 m/s2

$v2_y$ is the final vertical velocity

v_1 is the initial launch velocity

θ is the initial launch angle, as shown

$$\Delta d_x = (v_x)t$$

$$\Delta d_y = (v_{1y})t - \frac{1}{2}gt^2$$

$$v_{2y} = v_{1y} - gt$$

$$(v_{2y})^2 = (v_{1y})^2 - 2g(\Delta d_y)$$

$$v_x = v_1 \cos\theta \text{ (constant)}$$

$$v_{1y} = v_1 \sin\theta$$

Figure-6: Projectile motion [6]

We are assuming no air resistance. So, the particle travels exactly as it would while in a vacuum. Thus, we have the following equations describing the motion of a particle (projectile) in the absence of air resistance: using constant vertical acceleration in the downward direction (g), and zero acceleration in the horizontal direction (since there is no force acting on the particle in the horizontal direction, since air resistance is neglected). Sprinters need much more muscle because they do not have time to draw from body energy reserves. If I run 100m under 11 seconds, that's not enough time for the oxygen I'm inhaling to reach the muscles. Consequently, the muscles themselves must already have the energy they need to function anaerobically for a short period. This leads to a large build-up of type IIb muscle fibres, which are fast-twitch muscles. They are bigger and bulkier -- hence the muscular appearance -- because they contain phosphocreatine and ATP ready to use; they don't waste time drawing glycogen from other sources, breaking it into glucose, breaking the glucose down and finally using the ATP from that. There's no time for that in a sub 10 second race. As we get up near 400m runs, there will be a different distribution, with type IIa muscles mixing in fairly evenly with the IIb muscles -- both are fast-twitch, but the IIa muscles store energy as glycogen within the muscle. Since a typical 400m run lasts ~50 seconds, the muscles have enough time to break down a bit of that glycogen and create some ATP.

This is a long-distance runner.

They need to be able to endure long distance for their sport.

For long-distance runners (one mile and up), the dominant muscle type is type I. These muscle fibres are thinner and don't store as much glycogen, phosphocreatine or anything else like the type II muscles; they aren't as big. However, because a long-distance run can last anywhere from, say, five minutes for a mile, up to a few hours for a marathon, the body has enough time to draw from local and systemic stores of glycogen and convert it into ATP for the muscles. Of course, this requires the oxygen being inhaled; long distance running is aerobic exercise.

When we have enough time to let the oxygen you break it down, the key difference is whether or not the run is aerobic in nature or anaerobic. Because long-distance runners, they inhale reach their muscles, they fall under the aerobic category. Sprinters don't have enough time for inhaled oxygen to reach the muscles, and so the muscles themselves must contain enough energy to last the run.

What are the benefits and disadvantages of running? Running has become extremely common in our society in the last few decades. The excellent benefit of this sort of exercise is its intensity. It boosts fitness fast and burns more calories than other activities, making it appealing to individuals who wish to control their weight loss. Due to

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its strength, running releases endorphins, producing the runner's high, which many describe as an "energy buzz," a great antidepressant. Running has some possibly critical drawbacks that you should consider before choosing to take action regularly. The possibility of injury is higher than for some of those other aerobic activities. Asphalt isn't quite as awful as concrete, although not like dirt. Always wear cushioned running shoes made to minimize shock to the joints, and get a brand-new pair if your existing ones begin to workout. Girls should wear breast supports. Warm-up before you start a run, by running at a slow pace. If you experience pain in any joint, then stop running until you find the reason behind the problem. I've seen many men and women who ignored warning signs cannot run at all due to damage to ligaments, hip joints, and knees. This care applies to some physical activity, but since running areas the body to so much injury; it's of particular significance here.

Benefit: Increased fitness: Together with improving the lungs and the heart's state, running is a weight-bearing physiological action that promotes bone health. Running may also decrease stress levels. Despite allegations that running can lead to osteoarthritis of the knee, studies have shown otherwise. One study that assessed non-runners versus runners more than 21 years found that non-runners were twice as likely to build disabilities with atherosclerosis versus runners.

Disadvantage: Injuries: Irrespective of exercise level, doing too much too soon may lead to injuries.

Benefit: Weight reduction: Running is a high-intensity workout that employs the body's bigger muscle groups, leading to high-calorie burn for weight reduction. A 150-pound female that runs 3 miles in 30 minutes (6 mph) will burn off approximately 359 calories. When food intake doesn't cancel this out calorie shortage, moderate jogging levels can reduce weight.[6]

Disadvantage: Weight gain: Surprisingly many individuals gain weight once they start running or when preparing for a long-distance event. Causes of this weight loss might include increased muscle mass and enhanced glycogen in the muscle (that can be saved with additional water). Also, as weekly mileage rises, many men and women experience an increase in appetite. To satisfy this appetite, it isn't hard to eat excess calories, which causes weight gain.

Self-esteem

Benefit: The delight of achievement:

Whether you make a full lap around the park or cross the finish line of the first half marathon, jogging brings a sense of pride and achievement that's unique to other kinds of exercise. This feeling frequently gets runners hooked into running more regularly, joining a gym, or planning for long-distance races. This feeling of achievement and increase in self-esteem will help keep you motivated to stay with your workout plan.

Disadvantage: Stressed and pressured:

As soon as you start running, you will begin to join with other runners because of shared interests. You might be impressed with their devotion and feel challenged to maintain. Invitations to run farther or faster may be hard to turn down, but if you do not take things gradually and work at your speed, you risk burnout, injury, and feelings of defeat.

Advantage: Low cost: You need a great pair of running shoes to incorporate running into your exercise plan. You can fulfill exercise needs a no cost for a treadmill or a fitness centre membership by running outside, in nearby parks, or even on a college track.

Disadvantage: Possible to Become pricey:

While high-tech equipment isn't required, there's plenty out there, which may make running more pleasurable. GPS watches, compression sleeves, running hats, sports sunglasses, and unique foods and beverages can create running more costly. If you're planning to compete in races frequently, enrolment fees also pose a financial obstacle.

If You Would like to incorporate running into a workout regimen, specialists urge these four measures for security: Wear good running shoes that give the support you want. Choose warmer surfaces whenever possible. Do not push through the pain. Include strength training workouts.

To guarantee a safe beginning: Get the doctor's okay, and begins gradually by incorporating brief sections of running to some walking app. With time, raise the running parts and reduce your walking sections. Aim for shorter distances, and finish a 5K (3.1 miles) before taking on more distance events.[7]

Health benefits: Cardiovascular: While there exists the potential for injury while running (just as there is in any sport), there are many benefits. Some of these benefits include potential weight loss, improved cardiovascular and respiratory health (reducing the risk of cardiovascular and respiratory diseases), improved cardiovascular fitness, reduced total blood cholesterol, strengthening of bones (and potentially increased bone density), possible strengthening of the immune system and an improved self-esteem and emotional state. Running, like all forms of regular exercise, can effectively slow or reverse the effects of aging. Even people who have already experienced a heart attack are 20% less likely to develop serious heart problems if more engaged in running or any type of aerobic activity. Although an optimal amount of vigorous aerobic exercise such as running might bring benefits related to lower cardiovascular disease and life extension, an excessive dose (e.g., marathons) might have an opposite effect associated with cardiotoxicity.

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Metabolic:

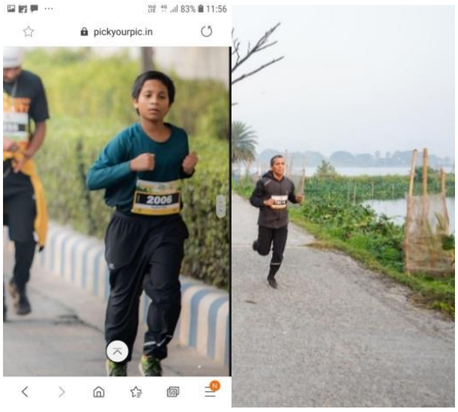

Figure-7: Running

Running can assist people in losing weight, staying in shape and improving body composition. Research suggests that the person of average weight will burn approximately 100 calories per mile run. Running increases, one's metabolism, even after running; one will continue to burn an increased level of calories for a short time after the run. Different speeds and distances are appropriate for different individual health and fitness levels. For new runners, it takes time to get into shape. The key is consistency and a slow increase in speed and distance. While running, it is best to pay attention to how one's body feels. If a runner is gasping for breath or feels exhausted while running, it may be beneficial to slow down or try a shorter distance for a few weeks. If a runner feels that the pace or distance is no longer challenging, then the runner may want to speed up or run farther.[8]

Mental: Running can also have psychological benefits, as many participants in the sport report feeling an elated, euphoric state, often referred to as a "runner's high". Running is frequently recommended as therapy for people with clinical depression and people coping with addiction. A possible benefit may be the enjoyment of nature and scenery, which also improves psychological well-being. In animal models, running has been shown to increase the number of newly created neurons within the brain. This finding could have significant implications in aging as well as learning and memory. A recent study published in *Cell Metabolism* has also linked running with improved memory and learning skills. Running is an effective way to reduce stress, anxiety, depression, and tension. It helps people who struggle with seasonal affective disorder by running outside when it is sunny and warm. Running can improve mental alertness and also improves sleep. Both research and clinical experience have shown that exercise can be a treatment for serious depression and anxiety even some physicians prescribe exercise to most of their patients. Running can have a longer lasting effect than anti-depressants.

How Much Should You Eat On A Run? Let's start with the basics—how much fuel to take in during training and racing. "After about 60 minutes of endurance-based exercise, glycogen stores in the muscles will begin to deplete without supplementation," says Monica Gonzales, a nutrition coach.

Your fuel should contain easily digestible carbohydrates, in the following amounts based on the length of time you are training or racing:

- Less than 75 minutes: No fuel needed.
- 1:15 to 3 hours: 30 to 60 grams of carbohydrate per hour.
- 3+ hours: 30 to 90 grams of carbohydrate per hour (This is highly individualized; prolonged activity may require more fuel to maximize performance).

This means if you're going out for a quick five-miler, you don't need any fuel. But if you're going out for a long 15-mile training run, you'll want to have some sort of carbohydrate to fuel your muscles. If you're sitting there shaking your head thinking, *But I don't need fuel, I've run 2 hours before without any,* that might work for you, and that's great. But these recommendations are based on the research, which the majority of athletes will perform better when they fuel properly according to these guidelines.

Real Food Fuelling Options: "Whole foods are always the best choice over engineered products because of the wide variety and complexity of nutrients available," says Gonzales. Though gels and other engineered nutrition products are designed to have an exact mix of nutrients for runners (and they are admittedly more convenient), she still recommends whole foods because they are easier for the body to digest and can be more budget friendly. Look for foods that are rich in easily digestible carbohydrates and that contain little fat or fibre, since this slow digestion and can cause stomach upset. So, what are those options? Bananas and raisins are two choices that tend to work well for many endurance athletes and have been proven to be as effective as sports nutrition products in research. (Seriously—there are actual studies comparing bananas and raisins to gels and sports drinks in endurance athletes.) "I love dried apricots and whole bananas for runners because of the simple carbohydrates and an extra bonus of being high in potassium," says Gonzales. Potassium is one of the electrolytes that gets lost in sweat. There has also been quite a bit of research finding the effectiveness of potatoes over gels as a racing fuel. And like bananas, potatoes are a source of potassium as well as vitamins B and C.[9]

How to Build a Real Food Fuelling Plan: To build your real food plan, start by choosing an option or two from below that you enjoy.

1. Honey: Honey is hands-down all-time favourite alternative to sports nutrition products. It was the first carb-based whole food option have experimented with, and

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liked it from the get-go. It was amazing by the positive effects, started researching honey as the perfect running fuel. It turns out that honey has the perfect blend of glucose and fructose, which results in improved absorption in the gut. Plus, it comes with vitamins, minerals, and even a tiny amount of protein. Over the last year, experiment was done with different types of honey and different consistencies. The taste of pine honey and silver fir honey are less sweet than most other kinds of honey.

2. Baby Food / Fruit Puree: Baby food is a perfect alternative to fresh fruit. Pre-made fruit puree is portable, requires no chewing, and comes in various flavours, varieties with coconut that contain a bit more-fat and types with rice, oats, and millet. Especially like that can reseal the pouches and split the portion. The advantage of baby food over homemade fruit puree is that it has a longer shelf life, and easily store any pouches and didn't finish during un or race.[10]

Table 1: Nutritional value of various whole food options compared to one GU energy gel

Item	Unit	kcal per unit	g/carbs per unit	g/fat per unit	g/protein per unit	g of fiber/unit
dried dates	2 dates	133	36	0	0.8	3.2
honey	1 tbsp	64	17.3	0	0.1	0
dried fruit bars	1 bar	130	30	< 0.5	0.8	3
baby food/fruit puree	90 g pouch	54	12.5	< 0.5	< 0.5	1.8
GU energy gel	1 gel	100	22	0	0	0

3. Dried Fruit / Dried Fruit Bars:

Dried fruit is an excellent alternative to fresh fruit during long runs and races for several reasons. First of all, they are calorie-dense and less bulky than fresh fruit. Secondly, they are shelf-stable, and you can store them for a long time. And finally, they don't get all mushy or icky from jostling around in your pack dried dates, as they are not overly sweet like raisins and are packed with potassium. Plus, you can quickly fill the dates with any nut butter of your choice for extra protein and fat, which might come in handy during very long efforts.

Practical Tips for Fuelling with Real Food:

As you may have noticed, all of my preferred whole food values options are high in carbohydrates and low in protein and fat. Why? Because during endurance exercise, carbs are the preferred fuel for your body, and you need to replenish them if you want to keep your intensity up and perform to the best of your abilities. The general recommendation is to consume between 30–90g of carbs/hour, depending on your body type, effort level, and duration of the event.

The table below shows the carbohydrate content of my favourite real food gelt alternatives and how they compare to a standard GU gel. If you go the whole-food route, be cautious about eating too much fibre, especially if you have a sensitive digestive system. The sports dietician Kyle van Horn suggests keeping fibre <5g/hour.

If you're a runner who tends to have GI issues, Gonzales recommends limiting high-fat foods before the run because foods high in fat (and fibre) slow digestion and put stress on your digestive tract. "Mid-run fuel may also be lighter for runners with GI issues," she adds, "which means they'll need to focus their replenishment in their pre and post and workout meals."[11]

- Dried apricots (6 pieces = 29 grams carbohydrate)
- Bananas (1 medium sized banana = 23 grams carbohydrate)
- Raisins (1/4 cup = 29 grams carbohydrate)
- Dates (2 medjool dates = 35 grams carbohydrate)
- Applesauce squeeze packets (1 pack = 20 to 25 grams of carbohydrate)
- Salted boiled potatoes or sweet potatoes (1 small potato or ½ large potato = 30 grams carbohydrate)
- Low-fiber dry cereal (nutrition varies based on type)
- White bread with honey or jam (1 slice + 2 Tbsp. = approximately 45 grams carbohydrate)
- Pretzels (25 mini pretzels = approximately 30 grams carbohydrate)

Then figure out the portion size that would equal 30-60 grams of carbohydrate per hour. Plan to eat about that much every hour of training/racing. Remember that fuelling with real food requires a bit more pre-planning than you might be used to. Wondering how you might carry some of these things, like bananas or potatoes, along the course? One trick is to mash them up before the race start and put them in a plastic baggie, then tear off the corner of the bag along the course and eat it like you would a gel. Or try making your own energy balls. Document your training fuel in a journal so you can track the fuelling plans that were successful for you and if any unintended issues arose with them. This will help you figure out your optimal race-day strategy. Keep in mind that everyone's body is different. Real food may help some excel, while others may prefer engineered sports nutrition products. Engineered products are generally customized to provide the right types and amounts of different types of sugars, so they may be more easily tolerated and absorbed compared to

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regular foods. But as Gonzales points out: “There is always value in knowing exactly what is going into your body and omitting preservatives and additives that will be inflammatory.”[11]

CONCLUSION:

Many people can accumulate more protein and fat in food which are acceptable by body and get digested during exercise. That’s when nut butter or protein bars with nuts come into play. Some members of running club take sandwiches and salami for 100K. They can accumulate and digest. However, add BCAA’s to drinking water or opt for drink mixes and gels that contain BCAA’s to minimize muscle breakdown and fatigue. Everyone should try more plant-based protein and fat options over the next few months to prepare for the Big Backyard Ultra races coming up.

REFERENCE:

1. McNair PJ *et al.* Stretching at the ankle joint: viscoelastic responses to holds and continuous passive motion. Med & Sci in Sport and Exer 2000; 33 (3): 354-358.
2. Knudson D *et al.* Acute Effects of Stretching Are Not Evident in the Kinematics of the Vertical Jump, J Stre & Cond Res 2001; 15 (1): 98-101.
3. Rai S and Sen DJ; VO_{2max} makes bridge between aerobic and anaerobic exercise: W J of Pharm Sci; 2016; 4(8): 90-97.
4. Rubenson J, Heliams DB, Lloyd DG. Fournier Paul A. "Gait selection in the ostrich: mechanical and metabolic characteristics of walking and running with and without an aerial phase". Proc Royal Soc Lond 2004; 271 (1543): 1091–1099.
5. Biewener AA. Animal Locomotion. Oxford University Press, US; 2003.
6. Cavagna GA, Saibene FP, Margaria R. "Mechanical Work in Running". Journal of Applied Physiology 1964; 19 (2): 249–256.
7. Pedisic Z, Shrestha N, Kovalchik S, Stamatakis E, Liangruenrom N, Grgic J, Titze S, Biddle SJH, Bauman AE, Oja P. "Is running associated with a lower risk of all-cause, cardiovascular and cancer mortality, and is the more the better? A systematic review and meta-analysis" *(PDF)*. Brit J Sports Med 2019; 54 (15): 100488-100493.
8. Lieberman D. "Foot strike patterns and collision forces in habitually barefoot versus shod runners". Nature 2010; 463 (7280): 531–535.
9. Brouns F, Senden J, Beckers EJ & Saris WH Osmolarity does not affect the gastric emptying rate of oral rehydration solutions. Journal of Parenteral and Enteral Nutrition 1995; 19: 403–406.
10. Burke LM, Hawley JA, Wong SHS & Jeukendrup A. Carbohydrates for training and competition. Journal of Sports Sciences 2011; 29(1): S17-27.
11. Chambers ES, Bridge MW & Jones DA. Carbohydrate sensing in the human mouth: Effects on exercise performance and brain activity. Journal of Physiology 2009; 587: 1779–1794.

DOI : 10.2016-19146535/ ; DOI Link :: https://doi-ds.org/doilink/02.2022-52844366/ASIO JPHMR/ 10.2016-19146535/V8/I1/461