Next Level Athletics and Fitness

Asymmetrical running and sprint training
A guide to running your PR every time you race.

Asymmetrical running and is based on the theory the left and right side of your body are control differently by the brain to perform a task such as running, sprinting, jumping. To make your body perform symmetrically will not produce the best performance. The biggest advantage of asymmetrical running is that you lose less energy and also will reduce your exposure to injury.

What makes one person fast and another not; is their efficiency level which is based on running and sprinting actions. Not the exact way they hold their, head, hand or their arms , but how they move the hand and when, how they move the foot, do they dorsi-flex and plantar flex, and even do they employ the actions at the appropriate time but also how the brain control each side to perform those actions.

We must be open to understanding the myriad of ways to create modifications to sprinting and running performance dynamics to truly grasp Asymmetrical running and sprinting.

The mind must be open to how forces are produced and the resulting effect from the transferring of forces on the horizontal and vertical displacement of the body center of gravity from asymmetrical actions by the body. The one thing to understand is that the brain has a neuromusclar control pattern for the right and left sides to accomplish the same task.

This requires an understanding of vertical and horizontal velocities from the asymmetrical point of view to run or sprint efficiently, which allows one to reach their true speed potential.

Vertical and horizontal velocities are the distance traveled by the hips in a prescribed time and how transferring forces affects the distance traveled in that prescribed time.

The prescribed time is during one of these four phase Start Acceleration, Pick up Acceleration

preferred push leg, arm contra-lateral

preferred stabilized leg, arm contra-lateral

Asymmetrical, one side has a different function

Symmetrical, both sides have identical functions

Running and Speed Maintenance

The four phases are made up of patterns and patterns are

a combination of actions

Start Acceleration is from initial movement to the point the hips rise enough to allow the leg to extend some , but still remain bent before foot contact, Pick up acceleration is from that point to the point where the hips rise high enough to allow for full extension of the legs before ground contact. Running or sprinting has a sub part of speed maintenance, Running or sprinting is when your hip are high enough to allow for full leg extension and you are still working at towards top speed.

Speed maintenance is when you are high enough to allow for full leg extension but your are no longer accelerating. You have reach top speed.

Each one of the above requires different actions to be efficiency during that phase.

The four phases will make up race strategy.

Hip height and traction are the main issue of no technique required. The two working together will allow you to reach your true speed potential by allowing you to do the above at greater velocities

We will examine the actions of asymmetrical running that are constant regardless of velocity or the body type or the sport. There are four main actions of asymmetrical running: leaning, foot strike, shoulder and hip oscillation and arm and leg movement. These actions can be developed to improve efficiency which will improve speed. They have to be develop each side independently.

Efficient running is based on how one employs combinations of synergistic movements and actions.

Shoulder and hip, arms and leg, body rock and pushing, leg curl and leg falling, foot strike and hand action, pelvic tilt and hip freedom, leg extension and lower arm movement. Those are the synergistic movements that must occur to maximize efficiency.

Things happen in combinations, always look for the combinations, for instance plantar flex foot and dorsi flex toes, leg curl and forward movement of the knee, leg extension and plantar flex foot, dorsi flex toes and knee lift, push down and lift, ball of the foot and leaning those are the combinations that I look for Synergistic movements, what one pair does the opposite may do it slightly differently

action happens in pairs, arm moves leg move, elbow moves knee moves, hand move feet moves, shoulder moves hips moves
one foot lowers the other rises
one knee move backwards the other moves forwards
many combinations of pairs action. If one happens the other will happen also.
Plantar flex dorsi flex toes
heel rises knee travel forward
Upper body action, back and forth rock

Efficient running is dependent upon the following:

Sprint actions

- Force produce are from the falling body, and arm and leg movement
- force transferred is from stiff leg and foot stance
- The running/sprinting process must originate with the forward lean of the body and the transmit force to the center of gravity During the start and acceleration process, the greater the forward lean the easier it is to overcome inertia. Forward lean also creates an auto swing action of the leg allowing for your foot to land in the correct position at ground contact.
- The ankle must be stabilized in a plantar-flexed position prior to or at ground contact; the toes must be dorsi-flexed prior to foot strike on the ball of the foot.
- Proper foot recovery will create high feet proportional to speed
- leg curl
- shoulder stretch
- shoulder girdle rotation
- Feet should land underneath the shoulders
- leg extension

- pelvic tilt
- Hip action, rotate and extend
- adduction

Posture:

- Not holding your body to a certain form
- Head is in neutral position automatically but eyes are focus ahead of body
- Shoulders and pelvis that are free to move
- Alignment of the core: chest to hip and shoulder to ball of foot. The chest should be out in front of the body. The shoulder should be aligned with the ball of the foot; it should not be directly over the ankle if drawing a line downward. If drawing a line diagonally it should be aligned over the ball of the foot. Formation of the number four by legs during ground contact, the earlier the better
- Lean: directing and redirecting forces, lean more to increase speed and less to reduce speed, but always maintain some type of forward lean. natural
- Pelvic is tilted upwards.
- hip height is controlled by leg recovery speed
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- Hip height at optimal level for speed, IE at speed high enough to allow leg to fully extend before foot touches ground, at the start high enough to allow leg to get into optimal pushing position.
- Forward lean speeds up foot recovery along with keeping heels off the ground

Sequential Arm Movement (SSAM):

SAM is the pattern of movement that the hands and arms go through while running or sprinting. Traits of SAM include the following:

- Elongation and elasticity
- Arms and hands assist the legs and feet with taking the shortest path during recovery
- Hands create low foot recovery during the acceleration process and high foot action at speed
- Hands and arms assist gravity in creating high foot velocity on the downward movement of the body, hands and feet
- Accessory forces originate from the downward acceleration of hands and feet movement
- Hands must return to center and pause before moving lateral left or right
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- arm action is one way. Side ways
- shoulder stretch, then elbow drive
- may create a body rock
- elbow degree is not fixed but is fluid
- elbow movement stops, degree will close or open, whole arm movement on the return
- hands move together, in same direction may form triangle,
- at start if race. Swing wide and narrow range of motion as speed increases

Foot Action:

- Foot action during running or sprinting is maintained with the stability of the whole body and body segments
- The ability to stay stable quickly at ground contact will dictate motion speed

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- Initially touching the ground with the fifth metatarsal and then ball of the foot reduces braking action
- Do not push off
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- Active foot strike: foot moving towards the ground aggressively
- Foot strike involves these four stages: initial, load, support and unloading
- Ankle joint must be stabilized by plantar flexing prior to or at ground contact
- Foot Plantar flexed
- Toes dorsi flexed
- Active with doris flex

Leg Action

- Stiff legs and joints at impact allow greater transfer of forces
- Hip height allows for the 100 percent strengthening of the leg on the front side, the earlier this occurs the faster you will run
- knee flexion occurs with heel lift
- be active with knee extension

Hips and shoulders

shoulder elasticity stretch creates hip movement, increase stride length while maintain foot velocity
shoulders should rotate about spine to avoid twisting

The various action are dynamic and work different for the four different phases and will be classified under one of the four following phases

Start Acceleration

Pick up Acceleration

Running

Speed Maintenance

Working Definitions:

Hip height, the distance from the ground to the hip. Max hip height is the distance from the ground

to the hip while standing on the toes

Covering ground, long stride length

Optimal hip height, the best height for the speed you are running

Pick up Acceleration- action needed to get up to speed and reach optimal hip height for running

Start acceleration

Running

Speed maintenance

traction, maximum frictional force that can be produced between surfaces without slipping

Maximizing ground contact: getting the most return out of forces produced

Synergistic movements: arm and legs, shoulders and hips, hands and feet, elbows and knees

Ground contact: period when any part of the foot comes in and stays in contact with the ground

Ground contact time: the length of time the foot stays in contact with the ground

Initial contact phase: when any part of the foot comes into contact with the ground before the loading phase begins; start of ground contact

Positive Speed: speed of a body segment in the direction of movement

Negative Speed: speed of a body segment in the opposite direction of movement

Frontside Mechanics: movement of body segments (arms and legs) occurring in front of the body as viewed from the side or the front

Backside Mechanics: movement of body segments (arms and legs) occurring behind the body as viewed from the side or back

Active foot strike and landing: acitvely moving foot movement towards the the ground prior to initial ground contact

Active forward body movement: hips of the body moving forward to catch up with foot.

Eccentric or Load Bearing Phase: when the downward forces of the body are absorbed by the joints and muscles of the leg or by the foot and plantar fascia

Isometric or Support Phase: when the joints and muscles of the leg or plantar fascia have fully adsorbed or bottomed out from the downward forces of the body

Stride Length: distance traveled by hips from unloading to loading phase

Stride Reach: distance from heel of foot(recovery leg) to leg(support) at the start of the unloading phase, the greater the distance the longer the stride length will be (this could be a negative distance)

Positive Foot Velocity: speed at which the foot is accelerated from the backside to the front side or up or both

Negative foot velocity: speed at which foot is accelerated from the front to the rear or downward or both

One Sided: arm stroke per two strides asymmetrical

Two Sided: arm stroke for each stride symmetrical

High foot: distance foot is off the ground before starting downward, not a function of knee lift

Dorsi Flex Toes: upward lift of the toes with the foot on or off the ground

Plantar Flex: downward position of the foot

Dorsi-Plantar Combo Flex: the upward lift of the toes with the downward movement of the foot

Ball of Foot: the section of the foot between the metatarsal phalanges joint and the head of the metatarsal

Fifth metatarsal

Knee to Hip Extension: when the knee joint holds steady as the hip moves over it to the front

Hip rotation

Stiff Leg: when there is no give between ankle joint and hip joint during load phase; knee can be bent at initial ground contact through load phase

Non-Stiff Leg: when the ankle, hip and knee joints give or collapse at initial ground contact through load phase

Vertical displacement of hips, positively and negatively: the movement, on the vertical axis, of the hips from rebound phase to support phase

Support phase: the time period that neither downward nor upward movement of the hip joint is occurring

Unloading or Concentric Phase: begins when the support phase ends and the upward motion of the hip joint begins, ends at toe off

Sequential Arm Movement (SAM): hands and arms move in a set pattern for the up stroke and down stroke. Hand and arm movement assists and affects legs and feet recovery speed.

Windlass effect: the tightening of the plantar fascia due to dorsi flexing of the toes

Windlass mechanism: the shock absorbing and rebounding properties of the plantar fascia

Kent foot strike, optimal foot strike position for max power and traction, using the fifth metatarsal

Body rock, slight back and forth to help with force production as the leg extends.

Pelvic tilt, action that allows for extension of legs takes place when running begins.

Concepts:

The start of any action must occur when one foot is in contact with the ground. Initiate forward movement by pressing the ball of the foot into the ground along with a forward lean.
Neck extension to keep head in neutral alignment

Hip height changes as one goes from start acceleration to pick up acceleration to running to speed maintenance.

Hip height should stay at running height during speed maintenance
Hip must move forward to drive leg down

Falling is a must to start movement, lifting up a leg to start movement is not falling.

One must be on the ball of the foot for falling action to work.
Must lift hips and not knees
Hip lifting action only works while on the ball of the foot
Foot strike must start on fifth metatarsal and not heel

Moving from stability to instability is caused by being on the ball of the foot and leaning.

Ground contact is composed of an initial contact phase, eccentric phase or load phase, an isometric or support phase and an unloading or concentric phase; at the onset of running or sprinting all phases still apply. The concentric phase and the isometric phase are the only two phases performed at the onset of running or sprinting.

All phases contribute to absolute velocity and acceleration due to their collaborative effort and effect on increasing or decreasing the amount of forces applied and energy returned during ground contact time.

The upper body is not a counter of lower body movement but the cause of it; shoulder elasticity is the main influence.

Stability is hip and shoulder action dependent; shoulders create hip movements and spine transmits movement and flexes and twist.

Maximizing ground contact time is the cornerstone of speed development. Can be maximized by landing on the fifth metatarsal and rolling to the ball of the foot

The biggest factor in creating, reaching and maintaining high velocity is how one employs the combination of synergistic movements to reach and maintain optimal hip height along with maximum traction.

High velocity equals high forces at impact; the ability to create and maintain high foot speed from start to finish will influence the forces generated and applied throughout the sprint race.

The body maximizes speed of movement and force production by moving long lever to short lever and short lever to long lever

Segmental Sequential Arm Movement (SSAM) is critical to control speed. Alter running speed by increasing or decreasing in frequency, range of motion or both.

Increasing velocity for any runner is just a matter of change in the SSAM pattern. A change in the range of motion, frequency or both affect velocity; the ability to alter one or both will dictate the ability to alter speed.

Leverage is a combination of directing and redirecting forces.
Adducting is leverage,adduct to push the his forward

The foot acts as second class lever, exploiting this action is one key to increasing efficiency.

The sensory input from the, fifth metatarsal and the ball of the foot permits the leg to act as a short and long lever arm.

The foot has the potential to act as a first and second class lever with the ball of the foot being the fulcrum point.

The biggest effect on stride length is metatarsal contact time. An increase in metatarsal contact time will give a better return of forces applied; the more energy that is returned means a greater stride length and greater efficiency.

Fifth metatarsal initial contact is better than first metatarsal . First is better than heel.

The biggest effect on leg recovery speed is Doris flex of the toes, not the foot but the toes. The sooner this action occurs after toe off the faster the leg will recover

Plantar flex prior to ground contact or at ground contact. This will allow for the fifth metatarsal to make initial contact with the ground

Toes will doris flex

Windlass effect influences stride length with the help of falling body weight and gravity. Foot strike, leg stiffness and flexion at the knee, hip and ankle joint during ground contact will influence the effectiveness of the windlass effect. Heels should not touch the ground whether you are running or sprinting.

Increase stride length by decreasing negative vertical displacement of the hips. The reduction of negative vertical displacement of the hips is added to the horizontal movement of the hips; therefore, ground contact time is not reduced but time to apply forces is increased.

Positive vertical displacement of the hips is influenced by how high a runner is on their toes. Negative vertical displacement of the hips is influenced by 2 factors: foot strike and how active one is in bringing the foot back towards the hips.

Positive vertical displacement is fixed once you start running or sprinting reducing negative vertical displacement of the hip joint is the key to maximizing ground contact time.

Different speed call for different hip height, optimal hip height allows for proper leg action.

Hip and shoulder oscillation increases stride length and is a product of relaxation and proper SSAM.

Becoming more powerful without being able to make use of the extra power is not efficient, force generation is a bigger issue than power generation, power generation is a bigger concern when not being efficient.

Stride recovery has two requirements: the ability to quickly get the feet into optimum position to return to the ground and the ability to accelerate them to the ground quickly once the optimum position is obtained. The higher the foot position at the start of downward travel towards the ground, the more force that can be generated.

Leg extension, the person with the best leg extension will win 100 percent of the time.

The earlier the leg extension occurs after foot recovery the faster one can run or sprint.

The more automatic action through the use of gravity and elastic energy, the faster one will run via greater efficiency.

Turnover is getting the feet back down to the ground any way possible, which is not very efficient.

Artificially reduced ground contact time is when one physically causes the foot to leave the ground too soon. Artificially lengthened ground contact time is when one physically causes the foot to stay in contact with the ground too long. Natural ground contact time is the resulting time length based on sensory input.

The biggest lesson to be learned is how not to push the ground or pick the feet up off the ground. Once feet make contact with the ground, both actions reduce the ability to reach true max velocity and maintain it. Maintain pressure on the ball of the foot via plantar flexion action.

Develop speed by being efficient in movements and not by being hurried or attempting to muscle your way to your true max velocity. Maintaining velocity is also about being efficient. Relaxation contributes to overall efficiency; relaxation is about ceasing to put forth effort in increasing your velocity.

Set up the stride pattern at the start of the race and alter the stride recovery; to increase, decrease or maintain velocity.

The ability to maintain a forward lean does not mean bending at the waist. Lean angle can be drawn from the ball of the foot through the hip to the shoulders prior to toe off at any speed. Leg speed has to match lean angle; the steeper the angle the faster the leg speed needs to be, to prevent bending at the waist. Altering lean angle will alter the speed of legs and arms. Leaning is free energy, standing erect will slow down arm and leg speed. When the ball of the foot presses the ground, during a forward lean of the shoulders, forces produced are being transmitted to the ground through the foot; with the whole body acting as an effective lever. The hips are the axis point and the ball of the foot is the fulcrum. These forces will be applied most effectively through stiff ankle, knee and hip joints.

Stride frequency follows stride length. An increase in stride length will lead to a decrease in stride frequency and vise verse. But leg recovery speed should not slow down.

High knees and high feet are speed dependent; the degree of high knee raise is a result of foot strike speed and joint stiffness.

The forward travel movement of the knee and foot should occur concurrently. Dorsi flex foot is good, dorsi flex toes is better.

It is critical to increase foot and leg recovery speed in order to run or sprint faster. Dorsi flex toes.

Altering hand/arm recovery speed will also alter foot/leg recovery speed while maintaining stride length integrity.

The heel of the foot should not touch the ground during foot strike when running fast or slow. The faster the speed, the higher the heel should be off the ground during ground support time.

Just moving the arms back and forth is not the most efficient way to run or sprint.

Driving elbows backwards is a key part of running fast, swinging the hands forward is not.

The hand moves downward before driving the elbow backwards. During recovery, the elbow pushes the hand forward before it moves upward. If you swing your arms back and forth.

Or reverse the hands moves upward and inward, before elbow drives backwards. With the aid of shoulder rotation.

If elbows are driven backwards, intentional knee lift is not necessary, shoulder should help drive elbows backwards.

Above action is the key to creating high feet and straight leg prior to ground contact.

Finishing kick for 200 meters and up - increase the speed in action of the hand and elbow movement as one tires. This will allow maintenance of foot recovery speed without altering stride length integrity.

Gravity does not affect horizontal movement directly but does so indirectly.

A bent knee upon ground contact will remain bent throughout ground support causing a reduction in energy return due to a reduction in forces applied.

At any speed, the leg should be straight upon the foot coming in contact with the ground.

Driving the foot downward via the hip is force application

To maximize leverage and forces applied, the foot should land slightly in front of the hips at speed.

The slower the running speed the closer the foot lands, but never underneath the hips at speed.

During the start of any race, the foot should land underneath the hips during acceleration.

During the start of a run or race the toes and feet should be doris flex

The heel of the foot touching or not touching the ground is shoe type dependent.

The heel should contact the ground after the ball of the foot has contacted the ground. But should not occur.

The length of time the heel stays in contact with the ground influences stride length and foot recovery speed.

Actively moving the hands rearward should not occur until the foot has contacted the ground. This creates a stronger glute contraction and helps to accelerate the body forward on each step.

Hand to shoulder gap should increase as speed increases, but hand to shoulder gaopp should never be at a fixed position, do not lock elbows

Actively driving the elbow backwards should occur when the ball of the foot has contacted the ground. Letting the hands move toward the shoulders freely will cause the recovery leg to straighten out. Once the leg has straightened out, allow gravity to pull foot back down to ground.

Each step must build speed, by using the shoulders to create hand and elbow movement properly along with hip movement.

During the start of a race, one should not drive the foot downward but should let it and the body fall back down to the ground. Let hip and glute elasticity work for you. This creates a greater force and increases impulse. One leg will push while the other leg will stabilize you to push

When running at any speed, allow the leg to extend to the front and fully straighten before the foot contacts the ground. *Assisting this process is how to foot strike.*
A bent leg at ground contact will remain bent throughout the ground support phase.

The higher the foot is when the leg is straight, the greater the force that will be created and applied; therefore, the more energy return.

Hands should flow in reverse direction of normal arm swing (counter-clockwise direction). This is the most advanced and natural way to run. Reverse or counter-clockwise hand movement is the most effective way to move the hands and arms while running.

The most efficient way to run at any speed is by landing on a straight leg. This will give the greatest

return of energy.

The ball of the foot controls, joint stiffness at and during ground contact. *Plantar flexing the foot prior to or at ground contact increase joint stiffness at contact.*

Learn to use gravity effectively from the start of running by learning to fall, and by learning to let the ball of the foot touch the ground before starting the down and back stroke.

Stomping the ground with the foot or driving the foot into the ground will not produce the correct force for running at optimum speed.

The foot and leg movement should mirror the hand and arm movement to create harmonic balance when running and produce the best rhythm.

A plantar flexed foot will create a stiff ankle, knee and hip joint, a dorsi flexed foot does not have any influence on ankle or joint stiffness stiffness.

A Plantar flexed foot, at ground contact, will transmit the greatest amount of force and allow for maximum energy return.

A dorsi flexed foot, at ground contact, is not a good transmitter of force.

Force can only be applied and energy returned when the ball of the foot is in contact with the ground.

The ability to dorsi flex the toes while plantar flexing the foot is key to increasing ball of foot contact time.

Elbow drive has the greatest effect and influence on propulsion while the foot is in contact with the ground.

Arm and hand movement is amplified by the shoulders. Shoulder movement should be wild and unrestricted. The spine amplifies and transmits the shoulder movement to the hips.

The smoother the hand and arm movement the better the running rhythm created.

A good running rhythm is the same as keeping the beat when dancing.

Running fast efficiently is a matter of keeping the beat but changing the tempo.

Having high feet is more important than having high knees for running or sprinting fast. The height of the feet when the leg is straight and in front of the body is the determining factor for force applied and energy returned.

Hand action and movement influences above. High knee is not required to run fast, therefore driving or lifting knees is not required. Knee lift is automatic and the height thereof is speed dependent.

Maintain continuous rotational speed at hip joint. Shoulder joint controls hip joint movement.

Shoulder oscillation is directed by hand movement.

There are two opportunities, when the foot is at zero velocity, to add energy. One is when the foot is in the air and the other is when the foot is on the ground. The opportunity that is most optimal is when the foot is on the ground. Attempting to add energy at any other time at zero velocity or at velocity does not create free vibrations.

Once initial speed is reached for any event, be it jumping, sprinting or distance running, then any effort to increase speed by any means other than relaxing is counterproductive.

Maintaining foot recovery speed is essential to success in any walking, running or track event as well as any jumping event.

SSAM allows for the legs to attain optimal position during rotation cycle.

One must understand the difference between driving elbows backwards and just swinging the hands backwards.

During the initial running, jumping or sprinting moment, the hand should be pulled up and forward first, not thrown backwards to initiate elbow drive.

2 Key leg positions, front leg is a straight leg prior to foot starting travel towards ground, early formation of the number four by the legs during ground contact,

Shoulder extension creates an elongation of the spine, which creates greater elastic energy. Intentional knee lift is required when running if a person swings the arms back and forth.

At the start of either a spring or distance race, the knee can occur after the first step and only on the second and third step. Works for either style of arm movement.

The knee lift occurs when the ball of the foot contacts the ground, just as when, the elbow drive occurs

After 10m, for a sprint elbows drive should become more evident.

Knee lift and shoulder action should be automatic.