

STRENGTH TRAINING FOR ENDURANCE ATHLETES

Strength Training Goals:

- 1) Improve performance
- 2) Fill any gaps within run training
- 3) Injury prevention

The Endurance Athlete's Needs:

- 1) Aerobic capacity, race pace, and race specific training (achieved through running)
- 2) Improve/maintain *mobility* and *stability*
- 3) Improve *Mass Specific Force (MSF)* – see “Proper Running Form for Endurance Athletes”
- 4) Improve/maintain muscle balance

*2) – 4) Are achieved in the weight room!

Improving Mobility/Correcting Dysfunctional Movement Patterns:

Runners experience mobility restrictions mainly in the thoracic spine (T-spine) and hips. To improve mobility, include soft tissue work and dynamic/static stretching as often as possible (daily is ideal).

Do not mindlessly mobilize. Stretch with purpose!!

Soft Tissue Massage – breaks up connective tissue, increases endorphins, improves range of motion (ROM) and blood flow. This process is very important for any athlete. DO NOT RUSH THIS STEP! A healthy body in motion is not only strong, but mobile. Mobility also plays a key role in strength development. More range within muscles and joints = more strength potential.

Perform soft tissue work with either a foam roll, peanut, or lacrosse ball (the harder the surface, the better). Hunt for sticky spots, and spend *at least* 90 seconds in each area. A good mobility routine should take at least 20 minutes.

Key areas to focus on: glutes, quads, IT band, hamstrings, calves, t-spine, lats, chest

Dynamic Stretching – improves range of motion, blood flow, increases heart rate, and prepares body to do work! Again, this process is very important for any athlete. DO NOT RUSH THIS STEP! You can also include static stretching before and after your workout

Example Dynamic Exercises: walking/lunging hip flexor, hamstring, and glute stretches, leg swings (forward, back, circular patterns), deep squats, deep lunges (forward, back, side), T-spine rotations and arm extension drills

Improving Mass Specific Force (MSF):

Three types of muscle fibers exist within the body. Slow fibers (**Type I**), fast fibers (**Type IIA**), and really fast fibers (**Type IIB**). *Type IIB fibers are the super power generators. To maximally improve MSF, we must stimulate Type IIB fibers. When stimulated, Type IIB fibers quickly provide maximal strength within the muscle, but only for a short period of time (less than 20 seconds).*

I know what you are thinking – don't distance runners need Type I and Type IIA fibers to perform well at their sport? Yes, that's right. However, do not discount the power of Type IIB fibers for distance runners. Remember, they are the maximal force producers, which leads to improved ground force production, which then leads to improved running economy. Make sure your run training is geared toward Type I and Type IIA fiber recruitment. Leave it to your strength training to fill in the gaps, activate Type IIB fibers, and maximally improve MSF!

The Phosphogen Energy System- OUR FRIEND:

Type IIB fibers are stimulated through two energy systems – the Phosphagen Energy System and the Glycolytic Energy System. To improve MSF through strength training, we must properly activate Type IIB fibers through the Phosphagen System, NOT the Glycolytic System. When the Glycolytic System is activated, lactic acid produces within the muscle tissue, causing the athlete to feel “the burn.” This burning sensation is beneficial for bodybuilders when it comes to weight lifting because it leads to muscle growth (what runners are trying to avoid).

Two types of muscle hypertrophy (growth) exist within muscles cells - *Myofibrillar Hypertrophy* and *Sarcoplasmic Hypertrophy*.

Myofibrillar Hypertrophy is good for runners. It leads to force production within the muscle cell without causing significant muscle growth/weight gain.

Sarcoplasmic Hypertrophy is not good for runners. It improves force production, but also leads to muscle cell growth and causes weight gain (not what we want).

The bodybuilder’s goal is to stimulate both myofibrillar and sarcoplasmic hypertrophy. Both are necessary for the bodybuilder because mass, not strength is the goal of the bodybuilder. Strength without mass is the goal of the runner. If a runner gained 10lbs of muscle from a lifting program, MSF would not maximize.

How to Activate Type IIB Fibers, The Phosphagen System, and Promote Myofibrillar Hypertrophy (all lead to MSF):

- 1) Stay within 85-100% 1 rep max (see table below)
- 2) Sets and reps should always stay below 5 (i.e. 3X5 @ 85% 1RM, 3X3 @ 90% 1RM, 2X2 @ 95% 1RM, 4X3 @ 90% 1RM)
- 3) Include ample recovery time between sets (5+ minutes)
- 4) Focus on one big lift per workout (preferably the deadlift, the squat is great but beware of lumbar spinal loading)

Adjust reps/sets according to the athlete’s needs (beginners need time to develop form first before pushing weight).

Prilepin’s Table:

Percent 1 Rep Max (RM)	Approximate # of Reps	Optimal Total Reps/WO	Training Effect
95-100%	3 to 1	7 (4-10)	Max Strength
85-95%	3 to 5	10 (6 – 14)	Strength
75-85%	10 to 5	15 (10-20)	Hypertrophy + Endurance
65-75%	20 to 10	18 (12-24)	Explosive Power, Endurance, Some Hypertrophy
55-65%	35 to 20	24 (18-30)	Endurance
45-55%	50+ to 35	100 (50-150)	Endurance

Beginner Training Progression (after learning lifts):

Session	Set 1 (% Body Weight)	Set 2 (% Body Weight)	Set 3 (% Body Weight)
1	3 reps @ 50%	2 reps @ 75%	1 rep @100%
2	3 reps @ 85%	2 reps @110%	1 rep @ 120%
3	3 reps @ 120%	2 reps @ 130%	1 rep @ 140%
4	3 reps @ 140%	2 reps @ 150%	1 rep @ 160%

Plyometric Training and Core Training:

Plyometric training also helps MSF. The main objective of plyometric training is the ability to generate max force in the shortest time possible. Keep plyometrics specific to the movements required in your sport. Perform 1 set of plyos after every set of deadlifts/squats. Plyometrics may include depth jumps, box jumps, and lateral jumps. Regarding core-training, the mid-torso

acts as a stabilizer which means the muscles within that area will maximize trunk stability. The abdominal wall doesn't relax and contract like a crunch! Therefore DO NOT spend your time doing a bunch of sit ups/crunches!! Standard sit ups also involve assistant muscle groups, like hip flexors (already worked in deadlift). Instead, perform isometric or slow isotonic abdominal work (planks, hollow holds, oblique 45, Running Man, ab 45).

Additional Strength Training Benefit:

Heavy strength training also improves bone density (HUGELY important for women and all runners). Any high impact sport (like distance running) causes muscles and bones to weaken overtime because muscles are constantly worked to full exhaustion. Stay healthy and get strong!

How to Improve/Maintain Muscle Balance:

Above all else, workouts should remain efficient and effective. Strength training sessions should include motions that involve pushing, pulling, bending from the hip, bending from the knee, and core control. *Pick one exercise that targets each motion-less is more!* Pick exercises that engage multiple joints and muscles (deadlift, squat, lunges, pushups, bench press, pull ups). Also keep in mind runners are constantly moving within the sagittal plane. Make sure to include 1-2 frontal/transverse exercises to maintain balance.

Strength Form Tips:

- 1) Encourage external rotation of hip (activates the glutes)
- 2) Keep weight in heel and big toe when squat and deadlift
- 3) Sit back in hips when deadlift and squat
- 4) Think "vertical shin" when deadlift and squat
- 5) Break parallel when squat
- 6) Maintain "puffy chest" when deadlift and squat

Periodization:

Periodization depends on the athlete's specific needs. Normal periodization usually requires some level of hypertrophy, which is what runners are trying to avoid. You may try **recycling** your workouts – cycling through strength sessions based on athlete's specific needs during that specific week or month. When the athlete's goal is MSF, the previous 2-3 sessions matter most, not what might happen in 3-6 months.

Keep track of your workout in a journal, and record your progress. THIS IS CRITICAL!

Example Workout (total training time: 1-1.30 hours):

Exercise	Type	Sets	Reps	Time	Rest
Mobility Routine	Soft Tissue Work, and Dynamic/Static Stretching	As much as needed	As much as needed	At least 20 minutes	None
Pushups	Pushing/Core	3	10		1 min
Deadlift + Plyo	Pulling/Core/Hip Bend/Knee Bend	4	3 @ 90%		5 min
Cossack Lunge	Hip Bend/Knee Bend/Core	3	10 each leg		1 min
Plank	Core	5	1	45 sec hold	30 sec
Oblique 45s	Core	5	6	7 sec hold	30 sec
Static Stretch	Soft Tissue Work/Static Stretching	As much as needed	As much as needed	10 minutes	None