

Using Plyometrics to Improve your Triathlon Performance

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Background

Plyometric exercises have been successfully used by sprinters and power athletes to develop their fast twitch muscle fibres and improve their performance. The question is – **can plyometric training improve the performance of athletes in triathlon and other endurance sports?** The answer is YES.

Plyometric training utilises the stretch-reflex mechanism, allowing for much greater than normal force to be generated by pre-stretching a muscle (the eccentric contraction) before it contracts. In plyometric exercise, overload is applied to skeletal muscle in a manner that rapidly stretches the muscle immediately prior to the concentric contraction i.e. drop jumping, standing jump, multiple jumps, single leg jumps, hops, and bounds.

These exercises develop neuromuscular firing patterns and improve the muscle contractility of specific muscle groups.

Paavolainen et al, 1999, has shown that explosive strength training significantly improved the 5km running performance of well trained runners. The effect was largely due to the neuromuscular adaptations that reduced the time to exhaustion. The researchers also found that the ability to produce force rapidly when the foot is on the ground, thereby maintaining a short ground contact time, is a factor predicting 5km running time. Furthermore, exhaustion during a 10km running trial was associated with a significant impairment in all of these variables – ground contact time increased and muscle activation decreased. Hence, plyometric training may improve running performance by ensuring that muscle activation remains high during the full duration of the race. This will ensure rapid force production when the foot is on the ground, reducing ground contact time, and ensuring a high running speed is maintained.

Another study by Spurr et al, demonstrated a 2.7% improvement in 3km running time and a 4.1% improvement in running efficiency at 16 km/h. The researchers studied male distance runners averaging 60-80km per week. The runners completed a 6 week plyometric program that increased from 2 sessions per week up to 3 sessions/week. Their contacts per session progressed from 60 to 180.

It should be noted that plyometric training is not a stand-alone training method. It is highly compatible and significantly enhanced by strength training. It is also extremely demanding, making it imperative that sessions are not completed in a fatigued state. Intensity, along with correct technique, is the key to this form of training. Volume should be kept low i.e. 90-120 contacts per session, as too much will actually have a negative effect.

Prior to starting a plyometric training program, a satisfactory degree of general and functional strength needs to be developed. This ensures that your bones, tendons, ligaments and muscles have the basic strength to handle the increased loading. The best general strength exercises are those that utilise your own body weight i.e. push ups, sit ups, dips, squats, calf raises etc. All major muscle groups should be worked. You need to complete at least 2 sessions per week for improvement, and allow at least 24 hours to recover between sessions. It is best to build up the amount of repetitions gradually, so that you can complete at least 30. When you get to this stage, you can add another set until you reach 3 sets. Take about 1-2 minutes rest between sets. The general strength phase should last for approx. 12 weeks. Concentrate on good technique and complete the exercises slowly.

Following the general strength phase, athletes would move into a maximal strength phase.

Maximal strength work would include using weights that can only be lifted up to 15 times. The sets would be increased from 3 to 5 and involve up to 6 repetitions. Exercises should mimic the movements used in your sport. A sample of this progression could be moving from a squat, to increased load, to the vertical jump. It has been suggested that an athlete be able to squat twice his body weight before attempting depth jumps. Please note: heavy plyometric exercises are not recommended to be completed until at least 12 months of general and maximal strength work has been completed. Children should not be lifting heavy weights until they have fully developed and matured, however light plyometrics is fine i.e. skipping.

All athletes should undergo a general orthopaedic/musculoskeletal screening before engaging in plyometric training. Particular attention should be given to structural or postural problems that are likely to predispose the athlete to injury.

How Often Should Plyometric Training be Performed?

Ideally, plyometric training should be performed 2-3 times per week depending on the phase of the season. Plyometric training will be used sparingly or eliminated in the final few weeks before competition. Low amplitude movements can be completed as part of the daily warm up (a thorough warm up needs to be completed prior to any heavy plyometric training). It should be completed early in the training session while still fresh. Plyometric training would ideally be performed in conjunction with a strength or speed session. It is important to use surfaces such as grass or resilient surfaces that absorb shock.

Triathlon Specific Plyometrics

Below are some examples of plyometric exercises that could be used in a triathlon training program:

Swimming

- Medicine ball throws and twists i.e. a partner drops a medicine ball down towards the chest of the athlete, who catches the ball (pre-stretch) and immediately throws it back. This is another high-intensity exercise and should only be used after some basic conditioning.
- Push-ups with a “clap” - the hand clap in between is a particularly vigorous way to condition the arms and chest. The pre-stretch takes place as the hands arrive back on the ground and the chest sinks, and this is followed quickly by the explosive upwards action. Once again, to get the best training effect keep the time in contact with the ground to a minimum.
- Swimming bench/pull or stretch cords (e.g. 3 sets of 10 repetitions using powerful strokes)
- Vertical jumps
- Bounding and double leg jumps (for dive starts and turns)

Cycling

- Depth jumps from up to 1m (ensure that you land mid-foot for stability, shock absorption, and to prevent injury). This exercise involves the athlete dropping (not jumping) to the ground from a raised platform or box, and then immediately jumping up. The drop down gives the pre-stretch to the leg muscles and the vigorous drive upwards the secondary concentric contraction. The exercise will be more effective the shorter the time the feet are in contact with the ground. The loading in this exercise is governed by the height of the drop which should be in the region of 30-80 cm. Drop jumping is a relatively high impact form of plyometric training and would normally be introduced after the athlete had become accustomed to lower impact alternatives, such as two-footed jumping on the spot.

- Wind Sprints (on the bike) – While riding into a headwind and using a large gear, ‘stomp’ on the pedals whilst out of the saddle for 100-200m. Concentrate on powerful pedal strokes. This can be done on the flat or up a short hill.
- Please note: many of the running exercises below are effective for cycling, as there is a crossover effect.

Running

- Bounding - This is a form of plyometric training, where over sized strides are used in the running action and extra time spent in the air. Two-legged bounds reduces the impact to be endured, but to increase the intensity one legged bounding, or hopping, can be used. Bounding upstairs is a useful way to work on both the vertical and horizontal aspects of the running action. Multiple jumps over a series of obstacles like hurdles is a valuable drill for athletes training for sprinting or jumping events.
- Single and double leg jumps
- Skipping
- Side-stepping
- Kick-outs
- Hops
- Tuck Jumps

Sample Plyometric Program – 5km Runner (Brandon, 2004)

The program below would be completed once per week in conjunction with two strength training sessions. It should be completed on an easier day or the day after an interval session.

1. High knee skip drill, 2 x 20m
2. Knee pick up drill (using mini hurdles) 2 x 10 hurdles
3. Fast knees-up drill, 2 x 20m
4. Power skips, 3 x 10
5. Mini hurdle hops, 3 x 8
6. Vertical jumps, 3 x 8
7. 4 x 30m sprints

References

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