Plyometrics is the term given to exercises designed to increase the power of an athlete, defined as the equivalent of explosive strength (Brukner & Khan, 2001), and referred to by others as "speed-strength" (Young & Bilby, 1993). In layman's terms the aim of plyometrics is to increase the explosiveness of the muscle allowing an athlete to run faster, jump further or generate force at a greater rate.
This type of training aims to produce a large and rapid stretch of the muscles being trained during the eccentric phase immediately prior to the concentric phase of the exercise (McArdell, Katch & Katch, 2001). A practical example of this action is when an athlete performs depth jumps:


Figure 1: Depth Jump Sequence (Pictures University of Oregon)

1) The athlete jumps from a raised platform
2) As the athlete's feet hit the ground and he or she descends into a semi-squat position the quadriceps muscles are rapidly lengthened. This is referred to as the prestretch, which generates a large stretch (myotatic) reflex (McArdell, Katch & Katch, 2001).
3) The athlete jumps vertically as high as possible, aided by the large concentric contraction of the muscles as a result of the stretch reflex.
   The reasons for the increased size of the muscles contraction is due to two key factors:
   - Increased elastic potential energy prior to the concentric contraction
   - Stretch-induced reflexes resulting in greater muscle activation (McArdell, Katch & Katch, 2001).

Hence plyometric training takes advantage of the stretch-shortening cycle (SSC), which is present in many sports specific actions, to increase the amount of force an athlete can produce in a given timeframe which equates to the power produced by that athlete.

So in theory an athlete should become more powerful and faster through adaptation to sport specific plyometric exercises, but does this work in practice?

McArdell, Katch & Katch (2001) state "Testimonials abound about the benefits of plyometric training, but such pronouncements cannot substitute for the lack of carefully controlled evaluations of both benefits and possible orthopaedic risks".
In contrast to this the "Explosive Plyometric Exercise" position paper of the National Strength & Conditioning Association states that plyometric exercise programmes "can improve performance in most competitive sports" and that properly applied plyometric programmes are no more dangerous than other forms of training (National Strength and Conditioning Association).
In a study comparing maximal power training and a combined weights & plyometrics regime, it was found that both methods resulted in significant improvements in sports performance including sprint times over 20m and 40m (Lyttle, Wilson & Ostrowski, 1996). The combined weights & plyometrics training programme produced better results in the stretch-shorten cycle movements tested. This

combined with Baker & Nance (1999) finding, that 40m sprint performance could be predicted by an athletes power in SSC exercises, suggests there is value in utilising this type of training for sprints of this distance.
Rimmer & Sleivert (2000) compared the effects of sprint-specific plyometric training against traditional sprint training on 10m and 40m sprint times. The plyometrics group showed significant decreases in both 10m and 40m times, however these improvements were not significantly different from the sprint group. In concluding the authors state that sprint-specific plyometrics can improve 40m sprint times by the same extent as traditional sprint training, possibly through decreasing ground contact times. Rimmer & Sleivert's findings also supported an earlier study that showed plyometric induced performance improvements were greatest over the initial acceleration phase of the first 10m (Delecluse, Van Coppenolle, Willems, Leemputte, Diels & Goris, 1995). In this study it was found that the plyometric training group gained significant improvements in their 10m sprint times when compared to high resistance, sprint, and passive control groups. The plyometrics group also improved significantly in their 100m sprint times when compared to the sprint and passive groups.

In summary it seems that the use of plyometric methods of training to increase speed is widely accepted and utilised by coaches and athletes. However for all the anecdotal support there are relatively few scientific studies cited in the literature that clearly define plyometrics as a viable mechanism for increasing speed.
Given the limited findings in this area, and the several research articles that suggest real benefits from plyometrics, it is clear that further well controlled studies are needed to clarify the role of plyometrics in training for speed.

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