

Long/Slow vs Short/Fast Stretch Shorten Cycle Plyometrics

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Plyometrics

Plyometrics utilises the physiological mechanism known as the The Stretch Shortening Cycle (SSC) which involves the stretching of musculature immediately prior to being rapidly contracted. This eccentric/concentric coupling produces a more powerful contraction than concentric action alone.

One view on how this mechanism works is that the concentric phase is enhanced by the storage and release of elastic energy during the eccentric phase. During the eccentric phase the active musculature is pre-stretched and absorbs energy which is temporarily stored and reutilized during the following concentric contraction. Additional mechanisms have been proposed to contribute to the SSC including the neural potentiation of the contractile machinery during the eccentric phase, reflex contributions from the muscle spindle and increased time to develop force (1).

This article examines two different type of plyometric activities and their associated SSC responses.

Stretch Shorten Cycle activities can be broken down into two sub-categories – Short (fast) SSC activities and Long (slow) SSC activities.

SSC definition:

Fast and slow SSC activity can be identified through examination of ground contact phases. Schmidtbleicher (2) proposed that these two activities could be differentiated by the Ground Contact Time (GCT) with Short/Fast SSC taking place in less than 0.25sec (250ms) whilst the Long/Slow SSC took longer than this cut off time.

In the Depth Jump (DJ) task, mean GCT was 0.24s (240ms) while in the Counter Movement Jump (CMJ) activity all CGT's were above this cut-off point. Analysis of these Long/Slow and Short/Fast SSC activities revealed that the CMJ is a slow movement but one which maximizes jump height, while the DJ is a faster, more explosive activity in which much greater peak ground reaction forces are developed.

A weak correlation was found between Long/Slow SSC and Short/Fast SSC ability suggesting that training in slow SSC tasks might not accrue benefit in fast SSC ability and vice versa. Subjects jumped significantly higher in the slow SSC activity compared with the DJ. Previous research examining performance between CMJ and purely concentric squat jumps (3) and between SSC and concentric only squatting exercise have suggested that the muscle spindle reflex and elastic energy contributions are not as active in Long/Slow SSC activity and that increased performance is due to long GCT allowing for the musculature an increased time to develop force. These mechanisms may explain why the performance outcome of Jump Height was greater in the CMJ than the DJ.

What are the Advantages/Disadvantages of using SSC activities in a gym setting?

The first question that must be asked is what are you hoping to achieve from your S&C program? Is it for improvement in a sporting activity, keeping fit, putting on muscle, improving your aerobic/anaerobic fitness or something else?

Long/Slow SSC Plyometrics

Performing 100's of Long/Slow SSC plyometric jumps as part of a gym circuit (with a high aerobic demand) will do little to improve any specific sporting performance – unless you are required to jump at a sub-maximal effort 100's of times in your sport!

The benefit of doing Long/Slow SSC jumps as part of any routine is that you will improve joint and tendon condition & stiffness. You will be adding a 'power' component to what is likely a low power workout (lifting weights at normal speeds or performing cardio typically results in limited power development).



There is often the promotion of specific circuit classes run by gyms that focus on jumping/power development – whilst you will certainly get the jumping volume in with these classes, you will not see much improvement in power development – as this attribute is one that needs to be trained like speed (as power = strength x speed) and fatigue reduces the capacity of the muscles to generate the speed of contraction required to improve this attribute.

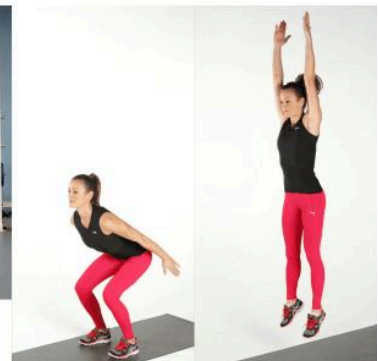
Examples of Long/Slow SSC Plyometrics that could be added to your gym routine includes:



Box Jumps



CMJ



Squat Jumps

Fast/Short SSC Plyometrics

You will rarely see Fast/Short SSC plyometric exercises in a gym environment. Reason being is that due to the very short ground contact times required to activate this muscular mechanism (<250ms), there is a very high ground reaction force (there is limited "collapse" of joints to soften the landing). This GRF can be 10+ times bodyweight depending on the drop height and so completing too many of these sorts of activities will quickly lead to overuse and likely injury (tendon, joint, muscle).

Unfortunately due to the general belief that Fast/short SSC plyometrics will injure clients, they are rarely included. But like all adaptation, as long as the volume is low and progressive overload is applied then including short SSC activities into circuits/programs is a great way of training the Central Nervous System and improving a physical attribute that is very useful anytime a client wishes to partake in any activity (running, jumping, changing directions).



Fast D/L Jumps

I often include low height Fast SSC jumps in my circuit classes – they are challenging to do, but due to the low GRF (due to the low drop height) and low volume, clients are able to complete this task without minimal issues.



Skipping

Skipping is also a great way of training the Short SSC with low GRF.

The technique for both these above exercises is to ensure that you pull your toes up, keep your ankle stiff (pulling toes up tightens your plantar fascia improving ankle/foot stiffness), land on the balls of your feet and then bound upwards with as little ground contact time as possible.

Examples of Short/Fast SSC Plyometrics that could be added to your gym routine includes



Hurdle jumps



Single leg hops



Mini box jumps (on/off).

SUMMARY:

1. Combine both Short and Long SSC into your training routines.
2. Keep volume of Fast/Short SSC low(30-50 contacts/session), particularly if you are trying to generate high GRF. (High drop heights with minimal shock absorption).
3. You can complete high volume of slow SSC if the GRF is low (eg skipping).
4. Do both jump types (Slow and Fast) with 1 and 2 legs and where possible forwards, sideways, backwards and with rotations.
5. Don't expect huge improvements in power if you are using these exercises as part of an aerobic circuit class.
6. Treat Plyometrics like speed training – not to be done every day – every 2-3 days is perfect.

BIBLIOGRAPHY:

1. An Examination Of The Slow And Fast Stretch Shortening Cycle In Cross Country Runners And Skiers Flanagan, E.P. Biomechanics Research Unit, University Of Limerick, Limerick, Ireland. June 2007.

2. [Schmidtbleicher, D. \(1992\) Training For Power Events. In P.V Komi \(Ed.\), *The Encyclopedia Of Sports Medicine. Vol 3: Strength And Power In Sport* \(Pp. 169-179\). Oxford, Uk: Blackwell.](#)
3. Bobbert, M.F., Gerritsen, K.G.M., Litjens, M.C.A., Van Soest, A.J.V. (1996) Why Is Countermovement Jump Height Greater Than Squat Jump Height? *Medicine And Science In Sport And Exercise*, 28, 1402-1412.
4. Plyometrics: An Overview. Fatch Fitness. <https://fatchfitness.com/plyometrics-an-overview/>

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