

The Jump Squat

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Introduction

The jump squat, or squat jump as it may also be referred to, is used within strength and conditioning programmes to develop lower limb power and increase movement velocities. It achieves this via an increased rate of force development (RFD), but with no significant reduction in peak force in comparison with a standard back squat.

Typical contraction times to maximum force for large human limb muscles are ≥ 300 ms. However, fast limb movements in sprinting and boxing involve contraction times of 50–250ms. Therefore, an increase in contractile RFD would significantly affect the force and velocity achieved during fast limb movements.¹

The jump squat can be used in conjunction with, or as an alternative to, the various weightlifting movements. However, some may argue that weightlifting movements typically produce higher power outputs and a greater rate of force production when performed correctly.

It is beyond the scope of this article to discuss this further, or to debate the use of one exercise above another. Suffice to say, the jump squat is another option to add to the S&C coach's tool box of exercises.

Rationale

The jump squat is a power exercise that engages the major extensors of the lower limbs (Fig 1) in a high velocity movement. When repeated without pause, this becomes a ballistic exercise that may be used as part of a plyometrics programme.

Not all athletes have the coordination, technical or physical ability to gain maximum benefit from weightlifting movements, and therefore the jump squat can offer an alternative method of developing explosive power.

Overview

The jump squat has been described in several variations. It can:

- utilise either a self selected or predetermined squat depth
- be initiated with either a countermovement or from a static start in the squat position
- be carried out with either a pause between repetitions or with continuous repeated efforts

For the purpose of this article, two variations will be discussed.

Gluteus Maximus	Hip extension
Gluteus Medius	Hip extension and lateral hip rotation
Quadriceps	Knee extension
Hamstrings	Hip extension
Erector spinae	Spinal and pelvic stabilisation
Lattissimus dorsi	Spinal and pelvic stabilisation
Adductors	Hip extension and stabilisation
Abdominals	Spinal and pelvic stabilisation

Fig 1. Major muscle groups involved in the jump squat.

The exercise

Prior to discussion of the exercise itself, an important caveat needs to be outlined. The squat jump should only be introduced when athletes have demonstrated competency in the back squat. The correct technique for the back squat has previously been described by Yule.⁸

The start position and descent for the jump squat are the same as for the back squat (previously described by Yule),⁸ and is shown in *Fig 2* (start) and *Fig 3* (descent to a parallel position). This is an example of utilising a specified depth, and while this depth may decrease the velocity, it may have use in developing the power and postural control under acceleration in novice jump squatters. This method can also be used when pausing to reset between repetitions.

From the bottom of the parallel squat position, the athlete then explosively extends their hips, knees and ankles, aiming to achieve as much height as possible, and subsequently landing with flexed knees to absorb landing forces.

The starting point and initial descent are the same when performing a jump squat to a self selected depth (*Fig 4*). The athlete will drop to their self selected depth and extend hips, knees and ankles explosively to achieve maximum height. Upon landing, the athlete will return directly to their self selected depth and repeat the process for the required number of repetitions. This method is normally performed with no rest or pause between repeated efforts and is described as a ballistic exercise.

Practical Applications

Studies have shown that peak power can be achieved with a wide variety of loadings that range between 0% and 90% of 1RM back squat load.^{2,4,7} This is a massive variance and could be based on the fact that studies have utilised a wide variety of subjects, including weightlifters and elite power trained athletes, and also encompassed upper and lower body exercises with their associated variances in system mass. This can sometimes lead to confusion if the testing criteria for these loads are not made clear, or are used in a generalised manner.

However, when discussing the jump squat specifically, it is more commonly reported that 30% to 45% of 1RM back squat is the bar load at which peak power is generated.^{2,5} Although this may be higher for elite power sport athletes such as weightlifters, most field sport and track athletes not specifically trained in power exercises will achieve peak power in the jump squat at or around 30% of their 1RM back squat load. It should also be noted that some individuals will achieve peak power at or near body weight i.e. 0% of 1RM back squat bar load.^{3,6} Interestingly, anecdotal data has suggested that there is no significant difference between maximal or optimal force outputs between a back squat performed at 80% 1RM and a body weight counter movement jump (CMJ), whereas the peak power and peak velocity for the CMJ was significantly greater than for the back squat. However, this has not been substantiated by published research.



Figure 2



Figure 3



Figure 4

Jump squats are an appropriate exercise for any athlete who has to run, jump, accelerate, decelerate and change direction rapidly or throw. It is an explosive exercise that can elicit high power and force generation without the need for high external loads, and as mentioned above, can be used as a body weight exercise that will still elicit high force and power generation when performed maximally.

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