Storage and utilization of elastic energy in vertical jump

Does increased jump height increase energy storage?
Based on these results,we infer that there was additional energy stored within the AT as a consequence of added mass applied to the body and that this additional energy storage did not occurwith increasing jump height.

Do jumpers store elastic energy in the Achilles tendon?
Previous studies have demonstrated an important contribution of elastic energy stored within the Achilles tendon (AT) during jumping. This study aimed to alter energy available for storage in the AT to examine changes in how jumpers distribute work among lower limb joints.

Does submaximal jumping reduce dissipation of energy at lower jump heights?
They concluded that during sub-maximal jumping to increasing jump heights,countermovement depth and rotation of large proximal segments were increased while contribution of work at the ankle was decreased 1. This was considered a strategy that minimised dissipation of energy at lower jump heights.

Does the eccentric phase increase VJ height?
The SSC in general has the storage of elastic energy during the eccentric phase,which will be released as kinetic energy during the concentric phase. However,there are 2 important distinctions with the amount of time during the eccentric phase increasing an athlete's VJ height.

How do we manipulate the mechanical work requirements of jumping?
To examine this we manipulated the mechanical work requirements of jumping in two different ways: (1) Body Mass Paradigm (BMP) - Altering body mass(for a constant jump height) to manipulate the work required for jumping; (2) Jump Height Paradigm (JHP) - Altering jump height to provide a comparable manipulation of total work.

How does tendon compliance affect jump height?
Increasing tendon compliance in the model led to an increase in elastic energy storage and utilization,but it also decreased the amount of energy delivered by the contractile elements to the skeleton. Jump height therefore remained almost the samefor both jumps.

Author: Drake Berberet Social Media Page HERE Transfer of Energy The ability to maximize transfer of energy in sport is typically what sets the elite athletes apart from the rest. Not only does it allow them to jump higher, run faster, and move more efficiently, it also allows them to save valuable energy so that ... Continue reading "Assessing Energy Transfer in the Vertical ...

More recently, several researchers have, however, argued that the storage and utilization of elastic energy does

not explain the difference in jump height between the CMJ and SJ (1,2,5,7,50,77-79), even though elastic energy enhances force production in both SJ and CMJ performances . More specifically, during the initial upward phase of the ...

The present study indicates that trained jumpers jump higher and have greater ME, possibly as a result of increased for production in the eccentric phase as a reflection of optimal ...

Semantic Scholar extracted view of "STORAGE AND UTILIZATION OF ELASTIC ENERGY IN SKELETAL MUSCLE" by G. Cavagna. ... An overview of muscle and tendon properties and how these interact during vertical hopping is provided and Muscle properties discussed are force-velocity and force-length relationships, electromechanical delay, muscle fiber ...

An alternating cycle of eccentric-concentric contractions in locomotion represents a sequence when storage and utilization of elastic energy takes place. ... sexes and of good physical condition performed vertical jumps on the force-platform from the following experimental conditions: squatting jump (SJ) from a static starting position; counter ...

There are some deficiencies and limitations in the use of elastic energy storage devices, and the deficiencies and limitations mainly reflects in the following aspects: (1) the mechanical properties and energy storage density of material for elastic energy storage devices are relatively poor; (2) the development of new products and new ...

The most common explanation for why AEL should enhance power is that 42 increased load in the eccentric phase amplifies elastic energy storage in the tendon and 43 aponeurosis, which can be ...

This sequence allows for a greater release of elastic energy, resulting in a higher jump. Exercises such as squat jumps and counter-movement jumps utilize the SSC and improve the storage and utilization of elastic energy. Aside from biomechanical factors, the physiological aspect of vertical jump height should not be overlooked.

outcomes of a jump. Here we we address the specific question of whether there is enhanced elastic storage and return of energy in the hip, knee and ankle extensors purely due to added load. We hypothesised that under these controlled ...

This will maximize eccentric strength, elastic energy storage and utilization, and eccentric velocity capacity. This is a feature of the Vertical Jump Protocol. Pair these strength moves (slow or fast) with plyometrics for a synergistic effect [9]. Use band-resistance to force your body into a greater eccentric velocity.

The crucial contribution of the countermovement seemed to be that it allowed the muscles to build up a high level of active state before the start of shortening, so that they were able to produce more work over the first part of their shortening distance. In the literature, it is well established that subjects are able to jump higher in

a countermovement jump (CMJ) than in a ...

When eliminating the arm mechanics associated with vertical jump testing, the use of flight time or the length of time the athlete spends in the air during a maximal vertical jump may be an effective method of vertical jump testing. ... Athletes generally can jump higher during a CMJ than a squat jump due to the storage of elastic energy and ...

Fig. 14. Vertical acceleration of the center of mass of the model as a function of its vertical displacement with the body in different positions ranging from a deep squat to standing. Zero vertical displacement of the center of mass signifies standing. (a) Vertical acceleration of the center of mass vs the vertical displacement of the center of mass (i) when peak, isometric, ...

The mean value (±SD) of potential elastic energy collected due to lowering of the center of mass during the countermovement phase of a vertical jump was 183 ± 69 J. 24.3% of this value can be considered the part of the potential elastic energy (44 ± 21 J) that comes from the transformation of kinetic energy.

This target article addresses the role of storage and reutilization of elastic energy in stretch-shortening cycles. It is argued that for discrete movements such as the vertical jump, elastic energy does not explain the work enhancement due to the prestretch. This enhancement seems to occur because the prestretch allows muscles to develop a high level of active state ...

Therefore the joint moment changes at the turning point of the jump with AEL suggests no change in elastic energy storage at the ankle (a key joint for storing and returning energy from the highly compliant Achilles tendon (22)), a potential small increase in energy storage across the knee, and a reduction in energy storage potential across the ...

Based upon the optimal control solutions to a maximum-height countermovement jump (CMJ) and a maximum-height squat jump (SJ), this paper provides a quantitative description of how tendons and the elastic elements of muscle store and deliver energy during vertical jumping.

The results suggest that although the leg extensor muscles of the men subjects could sustain much higher stretch loads, the females may be able to utilize a greater portion of the stored elastic energy in jumping activities. An alternating cycle of eccentric-concentric contractions in locomotion represents a sequence when storage and utilization of elastic energy takes place.

Estimation of potential elastic energy stored by lowering the center of mass during the countermovement phase of a vertical jump may offer some insight into the phenomenon ...

It is proposed that a stiffer MTU allows for improved storage and return of elastic energy which may have an impact on vertical jump performance. SSC muscle function has a specific purpose that is to enhance

performance during the final phase (concentric action) when compared with isolated concentric actions (McBride et al. 2008).

The utilization of a 1-step AJ may elicit greater vertical displacement because of a greater storage of elastic energy in comparison to a traditional CMJ. Although used in numerous sport actions, the literature is limited in the exact mechanisms of improving VJ performance through the possibility of a preactivation in the leg musculature that ...

This target article addresses the role of storage and reutilization of elastic energy in stretch-shortening cycles. It is argued that for discrete movements such as the vertical jump, elastic ...

Su, Eric Yung Sheng, Carroll, Timothy J., Farris, Dominic J., & Lichtwark, Glen (2024) Increased force and elastic energy storage are not the mechanisms that improve jump performance with accentuated eccentric loading during a constrained vertical jump. PLoS ONE, 19(8), Article number: e0308226.

The SSC in general has the storage of elastic energy during the eccentric phase, which will be released as kinetic energy during the concentric phase. However, there are 2 important ...

The present study was designed to explore how the interaction between the fascicles and tendinous tissues is involved in storage and utilization of elastic energy during human walking. Eight male subjects walked with a natural cadence (1.4 ± 0.1 m/s) on a 10-m-long force plate system. In vivo techniques were employed to record the Achilles tendon force and to scan real ...

The purpose of this study was to quantify the elastic properties of tendon structures in vivo and to investigate the influence of the tendon properties on jump performance with and without countermovement. Elongation of the tendon and aponeurosis of vastus lateralis muscle (dL) was directly measured by ultrasonography while subjects (n = 31) performed ramp ...