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Effects of Bilateral lower Body Resistance Exercises on Markers of Skeletal Damage

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Description

Athletes use different resistance exercise protocols to increase their muscle mass and strength. Recently, unilateral resistance exercises are preferred by athletes to provide hypertrophy in a shorter time. Detecting the differences between unilateral and bilateral resistance exercise's skeletal muscle damage marks may reply the athletes' choice reason. Many athletes prefer unilateral exercises to provide for the recovery during the rehabilitation process and hypertrophy in the resistance training. Demonstrating biochemical differences in the organism of bilateral and unilateral exercises at the same load may help them to choose between exercise types. Resistance exercises are widely practiced among athletes to improve performance. Some of the resistance exercises variables for specific performance outcomes are muscle action type concentric vs eccentric, load magnitude, volume load exercise selection, order, rest periods, repetition velocity, and training frequency. Proper resistance exercises prescription ensure for optimal hormonal and metabolic responses. Resistance exercises involve improvement in strength, power, hypertrophy, and local muscular endurance. There are many different types of resistance exercises. Bilateral variants are among the more commonly employed types of resistance exercises. Bilateral exercises are performed simultaneously with two limbs of the body, whereas unilateral exercises are performed with only one limb of the body.

Muscle Metabolism

Unilateral resistance exercises can lead to different reactions as compared to bilateral resistance exercises. Unilateral resistance exercises activated and strengthened deep muscle groups in the trunk and hip regions. Additionally, they influenced the activation of motor unit which can increase the stability for the leg muscle groups. Moreover, more load and intensive exercises are performed with more active functioning of the hip joint muscles in the single leg squat movement. Exercises cause muscle damage to the organism at different levels. Exercise-induced muscle damage (EIMD) is a common occurrence following activities with high eccentric components such as plyometric training, distance and long-term running, intermittent shuttle run, and resistance exercises. Moreover, depending on the changes to be made in the program of resistance exercises, different levels of muscle damage may occur in the organism. Alanine Aminotransferase (ALT) is widely used in the diagnosis of skeletal muscle injury and tissue damage in skeletal muscles. The most important indicator of muscle damage is CK level. On the other hand, LDH level is considered as a specific indicator of muscle fatigue. A cytoplasmic and mitochondrial enzyme, AST may increase in blood in a wide range of clinical disorders. In contrast, increased level of ALT in blood reported to be a specific marker of liver damage. In an exercise exceeding the limit that the muscle can lift; CK leaks out of the cell into the extracellular fluid, goes to the lymph system, and lastly into the bloodstream. One of the most valid and reliable methods for evaluating EIMD is to control the increase of CK levels in blood. Furthermore, observing CK and LDH levels in blood demonstrate the degree of metabolic adaptation of skeletal muscles to physical exercises. Both enzyme levels are found in muscle metabolism, and both have relatively low intensities. Their values are highly raised in blood following an intensive exercise. For this reason, it is important for the coaches to know the biochemical and hormonal responses to unilateral or bilateral resistance exercises.

Bilateral Deficit and Facilitation

Performance athletes in many branches work to improve muscle mass and strength during short preparation periods (2–4 week), especially. The athletes can prefer the unilateral resistance exercises, which is an alternative exercise to improve lower body muscle strength for short preparation periods. To better understand the effects of unilateral and bilateral resistance exercises, as adaptive stimuli, it would be informative to determine the difference both exercise types. Generally, there is a difference in total load between the both exercise types. This difference can be defined as bilateral index. The bilateral index used for interpreting the bilateral deficit and facilitation. The bilateral deficit is a recognized phenomenon that occurs when the maximum voluntary strength of a simultaneous bilateral contraction is less than the sum of the strength of the right and left limbs when contracting alone. The opposite situation is also defined bilateral facilitation. They have reported that the bilateral deficit has also been observed in situations involving the lower and upper limbs, small and large muscle groups, and during exercise of maximal and submaximal intensities. The exact mechanism underpinning this phenomenon is unclear. For this reason, many athletes think that unilateral lower body resistance exercises will cause faster hypertrophy and muscle strength. The second step was the determination according to Brzycki's multi-test coefficient for both types of exercise. The third step was the unilateral lower body resistance exercises. The fourth step was the bilateral lower body resistance exercises. All steps were carried out with a week interval. Also, all exercises were performed at the same days and hours in a week. Olympic Leg Press, Leg Extension, Leg Curl, and Smith Machine Calf Raise were used in the study as lower body resistance exercises. Participants performed all the movements for both exercises according to the protocols and under guideness provided by the fitness professionals.

Reported unilateral shoulder press produced greater activation of the back stabilizers, and unilateral chest press resulted in higher activation of all trunk stabilizers when compared with bilateral presses. Moreover, if the exercises are performed unilaterally, resistance exercises for the limbs may also cause the strengthening of the trunk. This result suggests that more muscle groups will include in activation for stabilization when unilateral exercises are performed. Vandervoort reported that the extent of motor unit activation of

bilateral resistance exercises decreased relative to unilateral resistance exercises. Thus, more CK release will occur in the organism during unilateral exercises. However, there is no statistical difference in CK levels between unilateral and bilateral resistance exercises in our study. It means that skeletal muscle damages are equally in both exercise types. There was no statistical difference according to time points of exercise types. However, there was statistical difference in LDH levels between bilateral and unilateral lower body resistance exercises. According to this result, bilateral lower body resistance exercises-induced LDH levels increased by 11.86% while unilateral lower body resistance exercises-induced LDH levels increased by 3.96%. This indicates that unilateral lower body resistance exercises is less fatigue than bilateral lower body resistance exercises.