Plyometrics in Rehabilitation: Need to Do, Not "Nice to Do"

Editorial

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Abstract

Traditional rehabilitation emphasizes restoring range of motion, isolated strength, and basic functional tasks, yet these approaches do not fully address the mechanisms driving functional decline with aging. Sarcopenia reflects neurological deterioration as much as muscle loss, with motor unit remodeling, impaired neuromuscular transmission, and selective fast-twitch fiber atrophy reducing the ability to generate force rapidly, a critical determinant of balance recovery and fall prevention. Rehabilitation focused solely on slow strength development therefore overlooks a primary contributor to loss of independence. Plyometric training provides a targeted stimulus for rapid motor unit recruitment, neural drive, coordination, and high-velocity force production, while also promoting favorable adaptations in bone density, body composition, and metabolic health. Because daily movements inherently require rapid force expression, integrating appropriately scaled plyometric exposure into rehabilitation may be essential for preserving functional independence across the lifespan.

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Editorial

Rehabilitation traditionally emphasizes regaining range of motion, isolated strength, and returning to activities of daily living. While these qualities are foundational, they do not fully capture the physiological domains most responsible for functional decline. The earliest and most consequential losses associated with sarcopenia are not rooted solely in reductions in muscle cross-sectional area, but in the nervous system's diminishing ability to generate force rapidly. Age-related motor unit remodeling, denervation, reduced discharge frequency, impaired neuromuscular junction transmission, and selective atrophy of type II fibers collectively produce a neuromuscular system that is slower - not simply weaker.[1,2,3]

This distinction has direct clinical implications, as falls are more of an issue of force production and force absorption, especially in a reactive way. Recovering from a trip and catching oneself from a fall requires rapid force expression. When rate coding and high-threshold motor unit recruitment are impaired, maximal strength alone is insufficient. Rehabilitation paradigms that focus exclusively on slow force production therefore fail to address a primary mechanism of functional decline.

Plyometric training offers a targeted intervention to address this neurological deterioration. By leveraging the stretch-shortening cycle, plyometrics demand rapid motor unit recruitment, enhanced neural drive, intermuscular coordination, and high-velocity force production, providing adaptations beyond what is typically achieved through traditional resistance training alone.[4]

Plyometric interventions in middle-aged and older adults have demonstrated improvements in dynamic balance, reactive stability, and functional performance outcomes directly linked to fall reduction.[5,6,7] These findings underscore the importance of training rapid force expression rather than relying solely on slow and controlled strength gains.

Skeletal adaptation provides an additional rationale for integration. Bone tissue is highly responsive to strain rate, with rapid loading and unloading cycles producing more robust osteogenic stimuli than slower compressive forces. Plyometric ground reaction forces generate high-magnitude, short-duration strain capable of stimulating bone formation and improving bone mineral density, particularly in fracture-prone regions such as the hip and femoral neck.[4,8] In aging populations where osteoporosis and sarcopenia frequently coexist, this dual stimulus is clinically significant.

Body composition adaptations further broaden the rehabilitative value of plyometric exposure. The literature demonstrates increases in lean mass, reductions in fat mass, and favorable regional hypertrophy following lower-body plyometric interventions.[9] Further, these adaptations extend into metabolic health and cardiometabolic risk reduction[10], areas that should be of major focus in all rehabilitation programs.

Taken together, the exclusion of plyometrics from rehabilitation represents a meaningful gap in care. If sarcopenia is neurological as much as muscular, if falls are failures of rapid force expression, and if bone responds preferentially to impact loading, then rehabilitation must address these domains directly. Ultimately, the demands of daily life are inherently plyometric. Stepping off curbs, catching balance, climbing stairs, and decelerating momentum all require rapid force production. Rehabilitation should prepare patients for these realities rather than limiting interventions to control predictable environments. Restoring strength rebuilds capacity, but restoring power reestablishes functional independence throughout the lifespan.

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