

Neuromuscular and Kinetic Comparison of Ballistic vs. Non-Ballistic Upper Extremity Training Modalities in Resistance-Trained Males

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Abstract

Optimizing neuromuscular activation and mechanical output during resistance training is a central concern in kinesiology and exercise science, particularly for enhancing explosive performance. This investigation compared kinematic, kinetic, and electromyographic profiles between two upper-body training modalities: a traditional pressing movement performed explosively and a ballistic throwing movement, both executed at 45% of one-repetition maximum. Seventeen resistance-trained males performed both conditions while bar displacement, ground reaction forces, and muscle activation of the pectoralis major, anterior deltoid, triceps brachii, and biceps brachii were recorded. Results demonstrated that the ballistic condition produced significantly greater mean and peak velocity, force output, mechanical power, and integrated EMG activity across all prime movers. Notably, the traditional press exhibited a prolonged deceleration phase comprising 40% of the concentric movement, accompanied by reduced neuromuscular activation. These findings suggest that ballistic loading strategies better maintain force production and neural drive throughout the full range of motion, providing a more specific stimulus for power development. This study underscores the importance of movement modality selection in exercise prescription for improving explosive capacity in applied kinesiology contexts.

Keywords

Ballistic training, Explosive strength, Electromyography, Kinetics, Bench press, Power development.