THE INFLUENCE OF CHAIN-LOADED RESISTANCE ON SUBSEQUENT 1-RM FREE-WEIGHT SQUAT PERFORMANCE

Mina, MA.1, Blazevich, AJ.2, Giakas, G.3, Kay, AD.4
1: UoD (Derby, UK), 2: ECU (Perth, WA), 3: UoT (Thessaly, Greece), 4: UoN (Northampton, UK)

Introduction

Varying the load during a back squat exercise using chains in combination with free-weight resistance (FWR) will manipulate the loading characteristics of the lift. Consequently, this may alter neuromuscular demand and induce post-activation potentiation (PAP). Preconditioning the muscle using near maximal or maximal voluntary contractions can increase force production and improve subsequent strength performance, however the influence of chain-loaded resistance (CLR) on subsequent free-weight squat performance has not been examined. Thus, the aim of the present study was to determine the effects of a chain-loaded resistance warm-up routine on subsequent free-weight squat performance.

Methods

Sixteen recreationally active men (age = 26.0 ± 7.8 yr, height = 1.7 ± 0.2 m, mass = 82.6 ± 12.7 kg) experienced in squatting (>3yr) volunteered for the study after giving written informed consent; ethical approval was granted from the University of Northampton. On two separate occasions the subjects performed either a FWR (control) or CLR (experimental) warm-up consisting of two sets of three repetitions of squat lifts at 85% 1-RM (35% of the load generated from CLR). After 5-min rest, subjects performed a free-weight resistance 1-RM squat; when successful a 5% load was added until subjects failed to complete the 1-RM. During the 1-RM, 3D motion analysis recorded knee joint kinematics, with vastus medialis (VM), vastus lateralis (VL), rectus femoris (RF) and semitendinosus (ST) electromyograms (EMG) simultaneously recorded. Repeated measures MANOVA's were used to examine EMG and kinematic differences between conditions; significance accepted at $p<0.05$.

Results

A significant increase in 1-RM (6.2%; $p<0.01$) and mean eccentric VM EMG (32%; $p<0.05$) was found following the CLR condition compared to the FWR control condition. However, no difference in peak and mean eccentric (8-10%; $p>0.05$) and concentric knee angular velocities (11-23%; $p>0.05$), or knee flexion angle (0.3%; $p>0.05$) occurred. No subjects increased 1-RM after the FWR condition, however 10 of 16 subjects (63%) increased 1-RM by ~10% after the CLR condition.

Discussion

Performing a CLR warm-up significantly enhanced subsequent free-weight 1-RM squat performance without changes in knee flexion angle. Thus, a real increase in 1-RM was achieved as the subjects clearly squatted to the same depth and did not compromise the mechanics of the lift. No change in concentric EMG activity occurred despite the increased load, which may indicate that the hip extensors were responsible for the greater muscle force production to be developed. Regardless, a greater 1-RM load was lifted following CLR as a warm up, which may enhance training stimuli.

Contact

m.mina@derby.ac.uk