Effects of Maximal Intended Velocity Muscle Actions on Training Indices

Brandon N. Jesse[1], Jack W. Sullivan[1], John J. Bartaszewicz[1], Hans M. Krueger[1], Tyler Neltner[1]

[1]Department of Health and Human Performance, University of Wisconsin-Platteville, Platteville, Wisconsin

INTRODUCTION

There has been recent interest in an alternative training method that prioritizes moving weight as fast as possible, termed maximal intended velocity (MIV). The purpose of the current study was to examine the effects of four sets of maximal intended velocity leg extension muscle actions on neuromuscular responses and performance (peak force (PF), peak velocity (PV), and peak power (PP)) in previously non-resistance trained individuals.

METHODOLOGY

Following a familiarization session, nine non-resistance trained men (mean ± SD: age = 21.4 ± 1.9 yrs; body mass = 80.3 ± 16.0 kg; height = 177.0 ± 7.8 cm) completed one-repetition maximum (1RM) testing of the leg extensors on a plate loaded machine. The subjects were then provided a 5 min rest before completing four sets of 10 repetitions at 55% of their 1RM, with one minute of rest between sets. The concentric phase of each repetition was performed at MIV. Electromyographic (EMG) signals were recorded from the vastus lateralis for the duration of the visit. To examine the effects of fatigue on performance and neuromuscular responses during the four sets of leg extensions, the values from the first two repetitions of set one and last two repetitions of set four were averaged and analyzed. The EMG amplitude (AMP) and mean power frequency (MPF) values were then normalized to their respective values from the 1RM testing condition. Paired samples t-tests were used to examine changes from set one to set four for the performance and neuromuscular parameters.
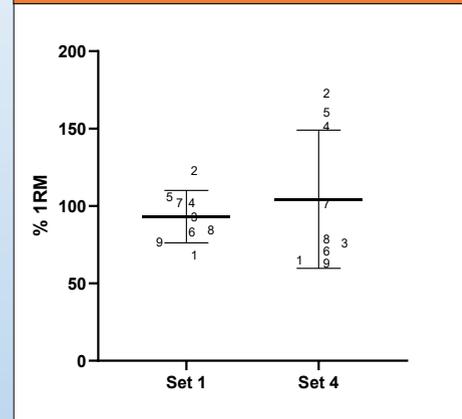
RESULTS

The paired samples t-tests indicated that there were no significant ($p > 0.05$) changes in performance or neuromuscular responses from set one to set four for any of the parameters.

Four sets of leg extensions performed at maximal intended velocity with 55% 1RM **did not produce significant fatigue or changes in neuromuscular responses,** highlighting MIV training as a **viable high-intensity method without performance decline** in **untrained individuals.**

PRACTICAL APPLICATION

The results of the current study provide strength and condition practitioners valuable insights into the effects of MIV muscle actions on performance and neuromuscular responses in previously non-resistance trained individuals. In lieu of using heavier loads that may negatively affect the form of the lift, coaches could emphasize moving the load as fast as possible. This would create high intensity muscle actions without the need for consideration of peripheral fatigue, on the condition that adequate rest periods are provided between sets.

FIGURE 1. Normalized EMG AMP

CONCLUSION

The results indicated that completing four sets of MIV leg extension muscle actions at 55% of 1RM did not induce measurable fatigue in performance, as evidenced by the subject's ability to sustain their PF, PV, and PP from the onset of set one to the end of set four. In addition, there were no changes in muscle excitation (EMG AMP) or motor unit action potential conduction velocity (EMG MPF) resulting from the four sets of leg extensions. The lack of changes in EMG AMP suggested that there was not a significant impairment in muscle excitation or recruitment patterns. In addition, four sets of 10 repetitions were not sufficient to induce the accumulation of metabolic byproducts that would result in excitation contraction coupling failure.