

THE MAXIMUM DYNAMIC OUTPUT IN THE JUMPING: EFFECTS OF EXTERNAL LOADING AND TRAINING HISTORY

Pazin, N., Nedeljkovic, A., Bozic, P., Berjan, B., Malobabic, V., Jaric, S.
Faculty of Sport and Physical Education

Introduction

The assessment of optimal external loading has been considered important from both theoretical (e.g., understanding of the basic design and optimization criteria of the muscular system) and practical aspect (assessment of optimal loading in athletic training and rehabilitation). The aim of this study was to examine the effects of two types of external loading on maximal dynamic output (MDO) during vertical jumps in individuals with different history of athletic training and physical activity.

Methods

Forty-one healthy male subjects were divided into 4 groups: strength trained (elite bodybuilders; BB, n = 10), speed trained (elite karate competitors; KA, n = 10), physically active (PA, n=11) and sedentary individuals (SE, n=10). Subjects performed maximal countermovement jumps and squat jump on a force plate under two types of loading conditions. First, elastic bands were applied to produce constant loading/unloading vertical forces ranging from +30% to -30% of body weight (BW). Second, a loaded vest was used to produce inertial loading ranging from 0% to +30% of BW. Both loading acted close to the subjects' center of mass, while MDO was assessed through the mean and peak power, and peak momentum.

Results

In addition to the main effects of 'group' and 'load', a two-way ANOVA also revealed significant group*load interactions in most variables of both jumps performed with two different loads. As expected, BB and KA demonstrated the highest, while SE demonstrated lowest values of MDO variables, while most of the data also revealed a decrease in their values associated with an increase in external load. Although the interactions suggest some moderate differences across the groups, none of the variables revealed maxima within the studied loading ranges.

Discussion and Conclusions

In general, the obtained data suggest that the optimal external loading condition for maximum vertical jumps should be unloading corresponding to -30% or more of BW. This clearly contradicts the generally accepted rationale for using external weights (i.e., applying positive loading) in the strength and power training of leg extensors since it should presumably provide the conditions for maximizing the muscular dynamic output. We believe that the discrepancy of our data with some (but not all) previous studies mainly originates from incorrect methods previously used (e.g., placing the load on shoulders, neglecting the mechanical participation originating from one's own body, etc.). Nevertheless, important problems remain to be resolved, such as the loading-MDO relationship in other types of maximum performance movements, as well as the relationship between the optimal loading for MDO and for the strength and power training.

Acknowledgments

The study was supported in part by a grant from Serbian Research Council (#145082).

Keywords:

muscle power, adaptation, training

TOPIC: TRAINING AND TESTING

PRESENTATION FORM: POSTER

SESSION ART: POSTER