

DIAGNOSTICS CONTROLS IN STRENGTH TRAINING OF TOP LEVEL THROWERS BY MEANS OF DYNAMIC PARAMETERS

Renzo Pozzo, U. Stiefken, Deutsche Sporthochschule, Köln, Germany

KEY WORDS: strength training, dynamometer, control methods, throwing events

INTRODUCTION: The relationships among force, velocity, mechanical power and time to reach corresponding levels characterize the (bio)mechanical structure of performing exercises in both training and competition. However, the possibility of specific adaptations of the neuromuscular system depends on the specificity of exercise execution, as well as on the modulation of repetitions and rest periods. This means that every strength exercise has a possible effect on performance, depending on the level of (bio)mechanical affinity with the kinetics and kinematics of the competitive movement and the individual particularities of neuromuscular functions. With this in mind, high-level throwers were tested with a special dynamometer during strength training sessions in different periods of training.

METHODS: A dynamometer was used for the evaluation of force, velocity and power produced during exercise with a free barbell. The device allows a precision of error below 1.2%. The subject groups were: 4 discus, 5 shot put (G1), 4 javelin (G2) male throwers and 4 shot put (G3) female throwers. Tests were carried out during 6 training periods lasting a total of 10 months. The following exercises were considered: squat jump (SJ) counter-movement jump (CJ), bench press (BP), power snatch (PS). For every exercise, individual power- and force-velocity curves were determined using increasing loads. Average velocity (AV), force (AF) and power (AP), as well as peak values and time to peak values were considered. Values were normalized with respect to body mass.

RESULTS AND CONCLUSIONS: AF, AP, peak P and time to peak P allow the differentiation of individual performance properties in different muscle systems. Flat or acute slopes of power-load curves permit us to identify possible combinations of AP and load in the training schedule in order to facilitate specific adaptation.

The time to reach peak power for the lower and upper legs is compared with the time structure of individual competition techniques, and significant differences between subjects are pointed out.

For SJ and CMJ, group G2 shows significantly higher AP and time to AP than the other groups.

Using counter-movement, either in jumping or in BP, shows differences in AP and peak power curves which account for particularities in the execution technique, and not just for the neuromuscular functions.

Individual characteristics of power response to load are compared in the follow-up analysis.