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ATHLETES TRAINING MANAGEMENT BASED ON THE CHANGES IN WORKING CAPACITY

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Introduction: Over the course of the season, athlete's working capacity, strength, and power output changes due to the factors such as accumulated fatigue, insufficient resistance exercise stimuli [1]. The quantification of training loads and volumes, including internal and external loads, is essential in prescribing the correct resistance training program with the optimal working ranges [2]. The physical performance tests (PPTs) are widely used to estimate an athlete's physical fitness level for different physical qualities [3]. Among these tests, the 1 repetition maximum (1RM) test is a commonly used test for measuring strength and prescribing the correct resistance training program [4]. Intensity of resistance training is defined as the percentage of 1RM, and this method allows coaches to prescribe optimum resistance training programming with the goal of avoiding training monotony and having higher adaptation responses. In addition, the athletes' specific internal responses to the prescribed load must guide whether the adaptation to the given stress is being achieved or not. The present study investigates the changes in working capacities of athletes in the resistance exercise with the physiological responses to the given stress for six weeks.

Goals: To evaluate the changes in working capacity of athletes to the training load. To analyze athletes' physiological adaptation to training using heart rate and lactate clearance tests. To quantify the rate of adaptation using linear and non-linear mathematical equations.

Methods: Six well-trained male subjects (31.6 ± 8.6 years, 75.2 ± 12.4 kg, 179.6 ± 6.8 cm), voluntary participated in the study. Participants were asked to perform bench press exercise under their%70 of 1RM until exhaustion once a week. Subsequently, heart rate right after (BPM_0), 30seconds (BPM_{30}) and 60 seconds(BPM_{60}) after the exercise and blood lactate response after 3^{rd} (bLa_3) and 13^{th} (bLa_{13}) minutes were recorded to quantify the rate of recovery. This protocol lasted 6 weeks. Improvements and reductions in repetitions were calculated as percentages (%) and charts were created including linear and exponential trendlines. Additionally, participants were asked to share their training programs. Training workloads were calculated as a total weight lifted by multiplying sets, repetitions, and weights. Average weekly workload was taken to see the relationship between the workload and collected parameters.

Results: Weekly average progression was shown as percentages and follows from week1 to week 6 as 15.3 %, 16.0 %, 16.5 %, 16.5 %, 17.0 %, 17.2 %. Highest improvement among the weeks were 33 %. and in average 16 %. 1RM of participants showed improvement by 3 % on average. Repetition until exhaustion under the intensities of 50–60–70–80 % gave the exponential decay functions of beginning and ending protocols as $y = 641.65e^{-0.06x,}$ $y = 680.64e^{-0.061x}$ respectively. Average heart rate responses (HR_0, HR_{30}, $HR_{60)}$ increased from week1 to week6 and exponentials of HRR showed a decrease (W1: $y = 131.59e^{-0.004x}$; W6: $y = 134.99e^{-0.002x)}$. Average peak lactate and clearance values decreased (W1: bLa_3: 5.9-$bLa_{13:}$4.9; W6: b bLa_3: 4.9-$bLa_{13:}$4.2), and recovery rates of the lactate from W1 to W6 decreases as linear equations indicate (W1: $y = –0.0967x + 6.1567$; W6: $y = –0.07x + 5.1433$).

Discussion and Conclusion: Weekly training volume of athletes correlates directly with their improvement in not only 1RM but also number of repetitions. The study showed that, rate of adaptations can be calculated with the use of strength endurance testing (%70 of 1RM). Weekly increase in average heart rate can be explained by the reductions in aerobic capacity since athletes training

have been more anaerobic based during the protocol. Practically, it is important to include strength endurance in the periodization. This argument is supported in the literature, stating that the main point in the periodization should be variation that includes aerobic and anaerobic training [5].

Keywords: adaptation, training programming, monitoring athletes, performance tests

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