

Increasing Vertical Jump Height using Two Alternative Post-Activation Potentiation Methods

ITZEL DE LA TORRE, SAMUEL MONTALVO, DANIEL CONDE, GABRIEL MEJIA-IBARRA, and SANDOR DORGO

Fitness Research Facility; Kinesiology Department; The University of Texas at El Paso; El Paso, Texas

Category: Undergraduate

Advisor / Mentor: Dorgo, Sandor (sdorgo@utep.edu)

ABSTRACT

Post-Activation Potentiation (PAP) is an exercise concept involving maximal muscular contraction to improve subsequent a dynamic contraction. An effective PAP method is one based on a balanced state of physical readiness and fatigue. Fatigued muscles reduce muscle performance. However, non-fatiguing muscular contractions at high loads with short duration can enhance muscle performance. Heart Rate (HR) can be used as an indicator of exercise readiness and fatigue. Additionally Heart Rate Percentage (HR %) was used as an indicator of readiness. **PURPOSE:** To assess the feasibility of using Heart Rate Percentage (HR %) as a readiness indicator during a back-squat PAP method. **METHODS:** Nineteen subjects (12 males and 7 females, age 22.37 ± 1.31 years, height $1.66 \pm .07$ m, weight 74.63 ± 15.63 kg and Body Mass Index (BMI) 26.66 ± 4.76 kg/m²) underwent three training sessions with 48 hours of rest between sessions of back-squat and vertical jump. On the first day each subject, underwent a baseline protocol to measure their One Repetition Maximum (1RM), Heart Rate (HR), and Vertical Jump height. Subjects then were randomly assigned to one of four experimental conditions: (1) warm-up, (2) no warm-up control condition, (3) PAP-Time, and (4) PAP-Heart Rate Percentage (HR%). Before each test, subjects performed a standardized 10-minute warm-up protocol. For the PAP Time and PAP Heart Rate conditions, subjects performed 5 repetitions of the back squat using 87% of their (1 RM), subjects then performed a vertical jump. For the PAP Time condition, subjects had a minute rest between the back-squat and the vertical jump, and three minutes of rest after the vertical jump before proceeding to the next cycle for a total of five sets. For the PAP-Heart Rate % condition, subjects rested until their heart rate reached 60% of their maximal heart rate (HRmax). The video-based MyJump2 app was used to assess vertical jump height. A repeated measures ANOVA was used to assess differences in vertical jump performance across conditions. A Bonferroni post-hoc test was used to identify pairwise differences. Significance level was set at an alpha level of $\rho < 0.05$. **Results:** The dynamic warm-up, PAP Time, and PAP Heart Rate % conditions showed significantly different jump heights (34.9 ± 1.6 cm, 36.4 ± 1.7 cm, and 36.4 ± 1.5 cm respectively) compared to the no-warm-up condition (32.6 ± 1.8) ($p < 0.05$). There were no significant difference between PAP Time and PAP-Heart Rate % conditions. **Conclusion:** Using heart rate percentage (%) as an indicator of readiness to maximize performance through PAP method can improve vertical jump performance. A dynamic warm-up can also exhibit effects similar to PAP exercise on vertical jump performance. PAP methods and dynamic warm-ups can be used to enhance measures of vertical jump performance.