

Abstract

Title: The effect of breathing technique on intra-thoracic pressure, kinematics of barbell, and muscle activity during bench press exercise.

Objectives: The main aim of this study is to determine relationship between breathing technique and bench press exercise. Furthermore, determine which breathing modification leads to overcoming highest resistance and how each individual breathing techniques (Valsalva maneuver (VM), Hold breath (HB), Lung packing (PAC), “reversed breathing” (REVB)) affects kinematics of barbell, and muscle activity, during different intensity (1 RM, 4RM, 8RM, 12RM).

Methods: Experiment of cross-sectional character, with usage of our-calibrated sensor, for intrathoracic pressure measurements, 3D kinematics with passive markers and surface electromyography. For measuring anthropometric measurements was further used goniometer, digital scale, and measuring tape. Comparisons of the breathing techniques was done by analysis of covariance ANOVA, while particular parameters were compared by Pearson correlation.

Results: Except of REVB technique, which indicated significantly lower load, there was no significant difference between techniques in lifted resistance. Similar effect was observed at results of intrathoracic pressure, where REVB technique showed significantly lower pressure, compared to other breathing techniques, which didn't have significant difference between each other. This results were applied for all measured intensities (1 RM, 4 RM, 8 RM, 12 RM).

From the view of easiest overcoming of the concentric phase, VM technique showed the best results. For easiest overcoming of the sticking and pre-sticking part of the movement, the PAC technique results were the best.

Except for partial differences at m. rectus abdominis and m. deltoideus posterior, the EMG data didn't show any differences in frequency of discharge between the breathing techniques in each phase of the movement. All the techniques also indicated significantly higher frequency of discharge at pre-sticking phase comparing with sticking and post-sticking, and also at at sticking comparing with post-sticking.

Keywords: electromyography, sticking point, performance, intrathoracic pressure, bench press