

Shoulder Flexibility and Strength Predict Dynamic Pushup Ratio in the 101st Airborne Division Soldiers

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Functional exercises such as an unstable-surface push-up are hypothesized to promote enhanced joint kinesthesia and muscular co-contraction to increase shoulder joint stability. Previous research has reported the benefits of using unstable-surface push-ups on upper body strength, trunk stability, and balance. Our preliminary work has demonstrated that individuals perform half less unstable-surface push-ups as stable-surface push-ups during a thirty second time period. We have hypothesized that individual's ability to perform unstable-surface push-up might be associated with shoulder and trunk rotation strength and flexibility. **PURPOSE:** To evaluate shoulder and trunk rotation strength and flexibility to predict unstable-surface push-up performance. **METHODS:** A total of 140 active duty soldiers were recruited from the Army 101st Airborne Division (27.8±6.9yrs, 175.1±8.4cm, 79.2±14.3kg). Subjects were instructed to perform as many unstable-surface push-ups as possible during a thirty second test period, followed by three minutes of rest and stable-surface push-up test during a thirty second test period. Dynamic push-up ratio (DPR) is the ratio of unstable-surface push-ups performed divided by stable-surface push-ups performed. A standard goniometer was used to measure the following flexibility: shoulder flexion/extension, abduction, and internal/external rotation. An isokinetic dynamometer was used to evaluate shoulder internal-external rotation, abduction-adduction, and trunk rotation peak torque at 60°/sec and trunk rotation flexibility. Predictor variables (flexibility, strength, and strength ratio) were entered in a stepwise multiple linear regression to predict DPR. **RESULTS:** Significant predictors of DPR in the linear regression model include shoulder abduction peak torque, shoulder external rotation flexibility, and shoulder abduction-adduction peak torque ratio (p<0.001, R²=0.277). **CONCLUSION:** Shoulder abduction and adduction strength may be focused on training to enhance DPR. However, those predictor variables can only explain 27.7% of the variance on DPR, and other neuromuscular characteristics such as proprioception, proper shoulder biomechanics, muscle activation patterns, and dynamic balance at the shoulder joint should be evaluated in future study.