

## Predicting Countermovement Jump Height with and Without Arm Swing with Core Strength Measurements

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### Abstract

**Objective:** Countermovement jump (CMJ) is a very frequent skill in many physical activities. Core strength (CS) played an important role in transferring energy or maintaining stability to promote CMJ performance (Kibler et al., 2006). But some research observed inconsistent results, they suggested the “specificity” of CS to sport event should be considered (Yaggie et al., 2006). Therefore, we designed 12 core strength measurements (CSM) (Waldhelm et al., 2006) to investigate the specific relationship between CS and CMJ height with / without AS.

**Methods:** 20 active college students were recruited (age: 22.1±0.3 year, body mass: 75.2±3.5 kg, height: 1.72±0.02 m, 7 males and 11 females) from local university. CMJ height was calculated from vertical ground reaction force data collected using a force platform (AMTI Corporation, Watertown, MA, USA). CSM were conducted on an isokinetic training machine (Biodex Medical Systems, Shirley, NY, USA). The isokinetic tests measured core strength during extension and flexion at speeds 60°/s, 120°/s and 180°/s. The isometric tests measured core strength with the core flexed at 60°, 90° and 120° angles.

**Results and Discussion:**

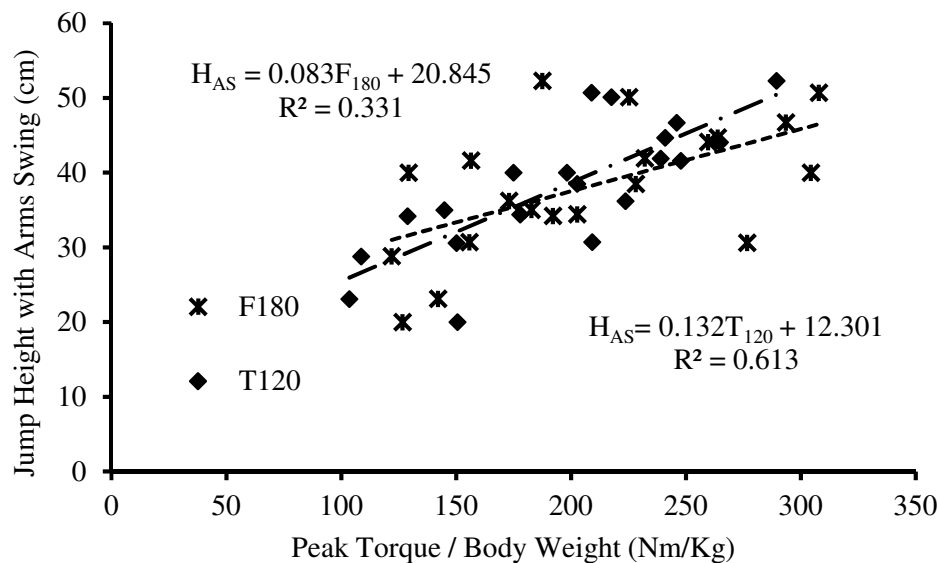


Figure 1 Regression Analysis of  $H_{AS}$  and CSM (n=20)

All of the CSM were correlated with  $H_{AS}$  and  $H_{NAS}$  ( $p < 0.05$ ) significantly. No CSM correlated with the difference of CMJ height with / without AS ( $D_{AN}$ ) significantly.  $F_{180}$  and  $T_{120}$  shared 68.0% variance with  $H_{AS}$ .  $T_{120}$  shared 57.0% variance with  $H_{NAS}$ .

Despite the inconsistent observation on the relationship between CS and CMJ performance, many elite athletes continue to perform CS training as an important part of their training program (Nesser et al., 2008). Core musculature was responsible for keeping the stability of the spine and pelvis (Hibbs et al., 2008). Core was crucial in transferring energy between larger torso and smaller extremities in sport activities (Kibler et al., 2006). Different core exercise train the different core musculature in different way, which the performance promotion is much depended on, the “specificity” of CS should be considered to promote CMJ performance (Sharma et al., 2012).

#### Conclusion

$F_{180}$  and  $T_{120}$  were good predictors for  $H_{AS}$ .  $T_{120}$  was a good predictor for  $H_{NAS}$ . Core strength in specific position could be considered for coaches, athletes and recreational players to improve CMJ performance.

Keywords: Muscle Strength, Isokinetic; Isometric, Performance