

## Anthropometric Predictors of Concentric Hip, Knee, and Ankle Work During a 5x5 Conventional Deadlift Routine

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### ABSTRACT

The deadlift is one of the most commonly performed exercises to strengthen the lower body, as well as one of the main lifts in powerlifting and strongman competitions. However, literature exploring the deadlift exercise and its variations remains quite limited compared to other popular exercises like squats and bench press. **PURPOSE:** The purpose of this exploratory analysis was to determine if there are relationships between anthropometric characteristics (arm length, torso length, thigh length, and shank length) and hip, knee, and ankle joint angular concentric work during a 5 sets of 5 repetitions (5x5) conventional deadlift (CDL) routine. **METHODS:** Eleven resistance-trained males who had experience with the deadlift exercise completed this study ( $21.5 \pm 1.4$  years,  $180.7 \pm 5.7$  cm,  $89.9 \pm 16.0$  kilograms). Limb lengths were measured by a 3-D optical scanner (Size Stream®). After completing a warm-up that consisted of 5 minutes of cycling at a self-selected pace and 2-3 minutes of lower body exercises (e.g., bodyweight squat and walking lunges), the subjects started deadlifting. Subjects performed warm-up sets of the deadlift exercise while self-selecting their repetitions and incrementally increasing weight during each warm-up set by ~10-20% until reaching a weight that they corresponded to an RPE of 8 on a Borg Category-Ratio (CR-10) scale. The subjects then underwent a 5x5 deadlift workout using the selected load, with 2-to-5 minutes of rest between sets. Joint angular work was assessed via a three-dimensional 12-camera Vicon motion capture system (200 Hz) and two force platforms (1000 Hz). Outcomes were averaged across sets 2-through-4 and analyzed using multivariate regression and relative importance analysis in the R software. **RESULTS:** Together, the predictors from the multivariate regression model did not correlate with hip ( $p = 0.75$ ;  $R^2 = 0.24$ ;  $R^2_{adj} = -0.26$ ), knee ( $p = 0.99$ ;  $R^2 = 0.05$ ;  $R^2_{adj} = -0.59$ ), or ankle ( $p = 0.11$ ;  $R^2 = 0.67$ ;  $R^2_{adj} = 0.45$ ) concentric work. Independently, the only predictor variable that correlated with any of the outcome variables was thigh length, which was a predictor of ankle concentric work ( $p = 0.03$ ). In this model, thigh length accounted for 37% of the variance in ankle concentric work. **CONCLUSION:** This preliminary research suggests that some gross anthropometric predictors may not explain hip, knee, or ankle joint concentric work during a 5x5 CDL routine. However, given the small sample size and exploratory nature of this work, the findings should be viewed as tentative until future research investigates the relationships between anthropometrics and deadlift mechanics.