

## ABSTRACT

The conventional deadlift (CD) is a popular exercise for assessing muscular strength. In addition to the general-public, athletic and tactical populations may use the conventional deadlift to assess an individual's strength and assist with program design. However, maximal strength testing may be time-consuming, fatiguing, require multiple pieces of equipment, and not be appropriate for certain individuals (e.g., untrained individuals). A leg/back dynamometer (LBD) is an isometric strength test that may be less stressful and time-consuming and offers an efficient approach to strength testing. **PURPOSE:** To assess the relationship and predictive ability that the LBD (isometric strength) has with 1RM CD (dynamic strength) in resistance-trained individuals. **METHODS:** This current research was part of a larger study that examined the relationship of the LBD with the CD and Hexagonal Bar Deadlift (HBD). Only the conventional deadlift was considered for this analysis. Data from 15 resistance trained individuals (8 male, 7 female) were analyzed. Subjects participated in three separate sessions, where they performed a 1RM HBD, 1RM CD, and LBD test on three separate days. The highest 1RM achieved was recorded for the CD. Measurements for the LBD were the best and average of three trials, taken to the nearest kilogram. Relative values for both tests were also considered. Correlations and bivariate regressions derived relationships between LBD values and 1RM CD ( $p < 0.05$ ). **RESULTS:** The results showed a significant and strong correlation between the maximum and average LBD and 1RM CD ( $r = 0.709 - 0.829$ ,  $p < 0.05$ ). The 1RM CD was predicted by maximum (explained variance = ~46%) and average (explained variance = ~56%) LBD. Relative 1RM CD was predicted by relative LBD max (explained variance = ~57%) and average (explained variance = 66.4%). **CONCLUSION:** Isometric maximal strength (LBD) was strongly related to dynamic maximal strength (CD). Although not as strong, the results showed that the LBD could predict 1RM CD. The average of both absolute and relative values on the LBD best predicted absolute and relative 1RM CD, respectively. The average of multiple trials on the LBD may be a better predictor for dynamic strength measured by the CD than the highest LBD value. Where appropriate, isometric strength tests may be a useful substitute for 1RM tests. **PRACTICAL APPLICATIONS:** Isometric strength tests, such as the LBD, could be a safe alternative to 1RM testing to track individual progress, reduce residual fatigue, and decrease time spent working up to a 1RM during testing. Since an isometric strength test is less fatiguing than a 1RM test, multiple trials may be considered for strongest predictive ability. The moderate explained variance could be due to the small sample size, position on the thigh of the LBD, or the difference in grips and grip length between the CD and LBD.

## INTRODUCTION

- The conventional deadlift (CD) is a popular exercise for assessing muscular strength. In addition to the general-public, athletic and tactical populations may use the conventional deadlift to assess an individual's strength and assist with program design (1).
- Maximal strength testing may be time-consuming, fatiguing, require multiple pieces of equipment, and not be appropriate for certain individuals (e.g., untrained individuals). Depending on the population, an ideal strength test administered to a large group would minimize fatigue and be safe to perform for all skill levels (2).
- A leg/back dynamometer (LBD) is an isometric strength test that may be less stressful and time-consuming and offers an efficient approach to strength testing (3).
- Najiah et al (4), found a near perfect relationship between the LBD and 1RM CD ( $p < 0.001$ ,  $r = 0.984$ ). However, Najiah et al (4) did not investigate the use of prediction equations between the LBD and 1RM CD and had participants pull the handle from below the knee. Previous research has shown peak force is produced around mid-thigh position (5).
- An investigation of prediction equations between the LBD and 1RM CD may be useful for tracking strength changes for individuals or predicting a possible 1RM load for individuals who cannot perform a maximal strength test.
- The purpose of this study was to assess the relationship and predictive ability that the LBD (isometric strength) has with 1RM CD (dynamic strength) in resistance-trained individuals.

## METHODS

- Data from 15 resistance trained individuals (age:  $23.3 \pm 3.6$  years, height:  $169.9 \pm 8.7$  cm, body mass:  $78.7 \pm 14.5$  kg), including 8 men and 7 women, were analyzed.
- Subjects participated in three separate sessions, where they performed a 1RM CD, 1RM hexagonal bar deadlift, and LBD test on three separate days. Standard methods were used for the strength tests (6,7), and the hexagonal bar deadlift was not considered in this study.
- The highest 1RM achieved was recorded for the CD. Measurements for the LBD were the max and average of three trials, taken to the nearest kilogram. Max and average values were considered for the LBD. Relative values were considered for both tests.
- Correlations and bivariate regressions derived relationships between LBD values and 1RM CD.

## RESULTS

- Both the LBD absolute max ( $r = 0.709$ ) and average ( $r = 0.766$ ) values had moderate relationships with 1RM CD, with approximately 46% and 56% explained variance, respectively (Table 1).
- Both the LBD relative max ( $r = 0.774$ ) and average ( $r = 0.829$ ) values had a moderate to strong relationship with 1RM CD, with approximately 57% and 66% explained variance, respectively (Table 1).
- Bivariate regression revealed significant ( $p < 0.05$ ) predictive equations using absolute LBD max and average, respectively (Figure 1).
  - $Absolute\ 1RM\ CD\ (kg) = 53.195 + 0.618(Absolute\ LBD\ Max)\ (kg)$
  - $Absolute\ 1RM\ CD\ (kg) = 48.298 + 0.688(Absolute\ LBD\ Average)\ (kg)$

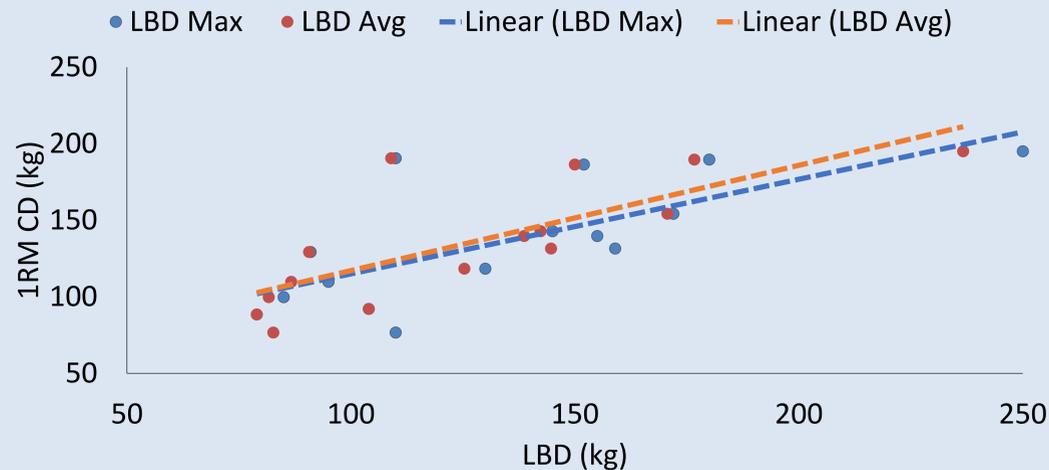


Figure 1. Scatterplot and Line of Best Fit on absolute LBD Max (kg) and absolute LBD Average (kg) with 1RM CD (kg) (N = 15).

Table 1. Significant correlations and bivariate regression analysis on both absolute and relative max and average LBD values with 1RM CD (N = 15).

Variables	<i>r</i>	<i>r</i> <sup>2</sup>	Adjusted <i>r</i> <sup>2</sup>	<i>F</i>	<i>p</i>
<b>Absolute LBD Value</b>					
Max	0.709	0.502	0.464	13.109	0.002
Average	0.766	0.587	0.555	18.480	<0.001
<b>Relative LBD Value</b>					
Max	0.774	0.599	0.568	19.386	<0.001
Average	0.829	0.688	0.664	28.633	<0.001

## CONCLUSIONS

- The results of this study showed moderate relationships between the LBD and 1RM CD. Additionally, the LBD could significantly predict 1RM CD. These results support previous research showing isometric maximal strength (LBD) is related to dynamic maximal strength (CD) (4,8).
- The LBD max and average were involved in significant prediction equations for 1RM CD. The moderate strength of these equations (46% and 56% explained variance, respectively) could be due to the small sample size. Other factors may also play a significant role in 1RM CD, such as grip width, grip used, range of motion, and position of the handle on the thigh.
- LBD average values produced stronger relationships between the LBD and CD compared to the LBD max values. The average of multiple trials on the LBD may be a better predictor for dynamic strength measured by the CD than the highest LBD value. Multiple trials may increase reliability and reduce the effect of outliers, leading to a better representation of compound lift performance and predictive data.

## PRACTICAL APPLICATIONS

- Isometric strength tests, such as the LBD, could be a safe alternative to 1RM testing to track individual progress, reduce residual fatigue, and decrease time spent working up to a 1RM during testing. Since an isometric strength test is less fatiguing than a 1RM test, multiple trials may have the strongest predictive ability.
- Where appropriate, such as testing untrained individuals or individuals rehabilitating an injury, isometric strength tests using the LBD may be a useful substitute for 1RM tests.

### References

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