

Introduction

Firefighters are routinely assigned the tasks of carrying external loads consisting of equipment and gear ranging from 20-35kg. The additional external load is standard but not personalized resulting in firefighters carrying inconsistent amounts of dead mass (DM). The ability to manage a load may be dependent on fat mass. A novel way to categorize load assignment is based on firefighter body composition and the mass of the external load. The load carriage index (LCI) = (lean body mass)/(fat mass + external load) is the proportion of lean body mass to compared to their DM. Firefighter ability to manage load may be dependent on absolute and relative strength factors due to additional muscle mass.

Purpose

This study was conducted to determine possible associations between the load carriage index (LCI) with whole-body absolute and relative strength in career male firefighters.

Methods

Male career firefighters (n=18, 35+/-8 yrs) completed a bioelectrical impedance body composition assessment (20.01±8.13) and a whole-body isometric strength test. The whole-body strength test consisted of an isometric midthigh pull (IMTP) using a load cell. The IMTP required firefighters to complete 3 trials of a 5-sec isometric contraction using a custom strength testing device with an integrated load cell. The peak IMTP value was used to calculate relative strength (1.36±.36) (peak IMTP/body weight). The peak IMPT value was used to represent absolute strength (358lbs±69). Bivariate correlations were used to determine the association of the LCI with weight pulled in pounds. Alpha level was set a priori at .05.

Isometric Mid-Thigh Pull



The IMTP required firefighters to complete 3 trials of a 5-sec isometric contraction



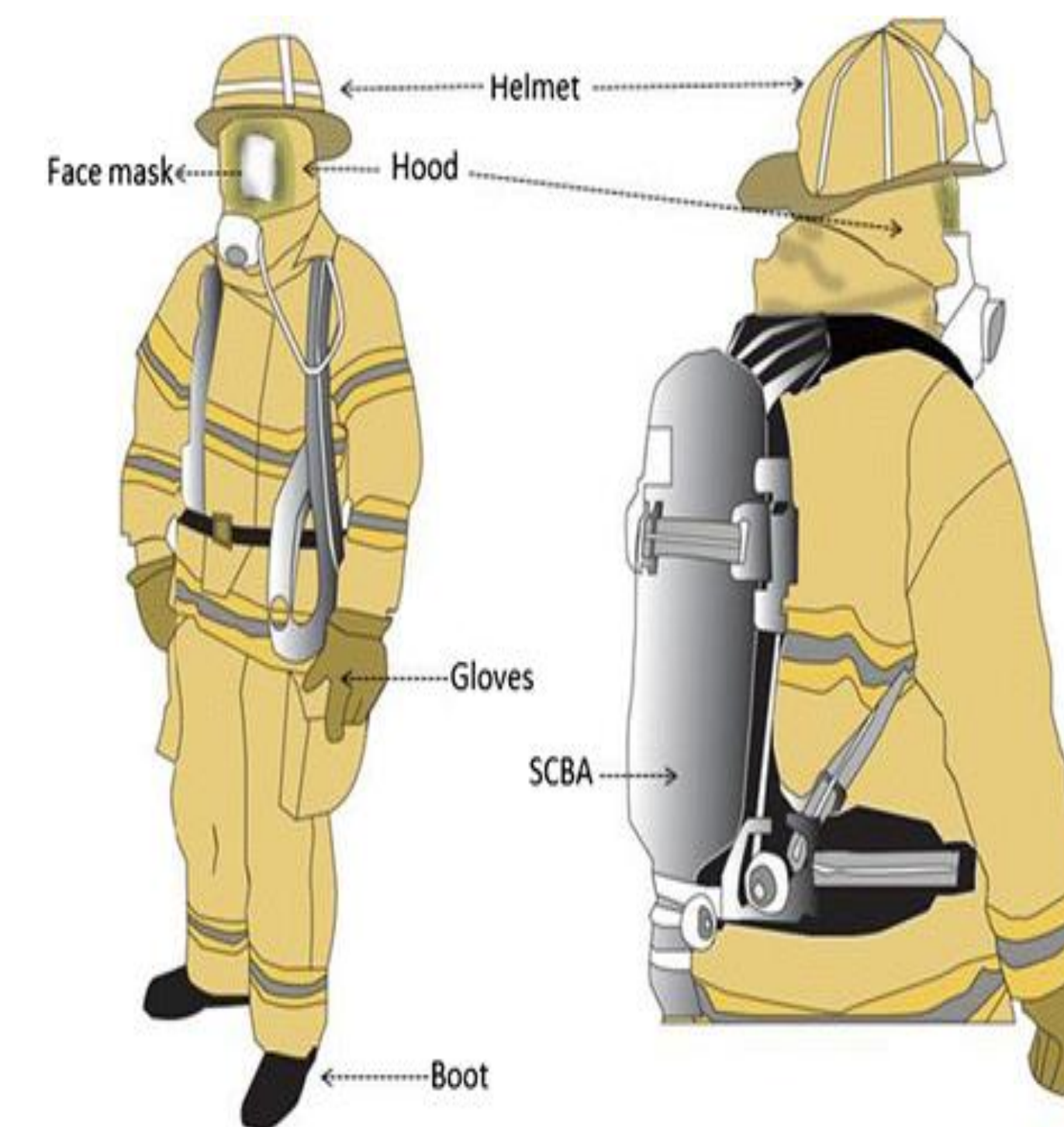
The peak IMTP value was used to calculate relative strength (peak IMTP/body weight).

Load Carriage Index

The load carriage Index:

$$(LCI) = \frac{\text{lean body mass}}{\text{fat mass} + \text{external load}}$$

is the proportion of lean body mass to compared to their DM.



Results

Both whole-body absolute strength ($r = .500$; $p = .041$) and relative strength ($.584$; $p = .014$) demonstrated a positive significant correlation with the LCI.

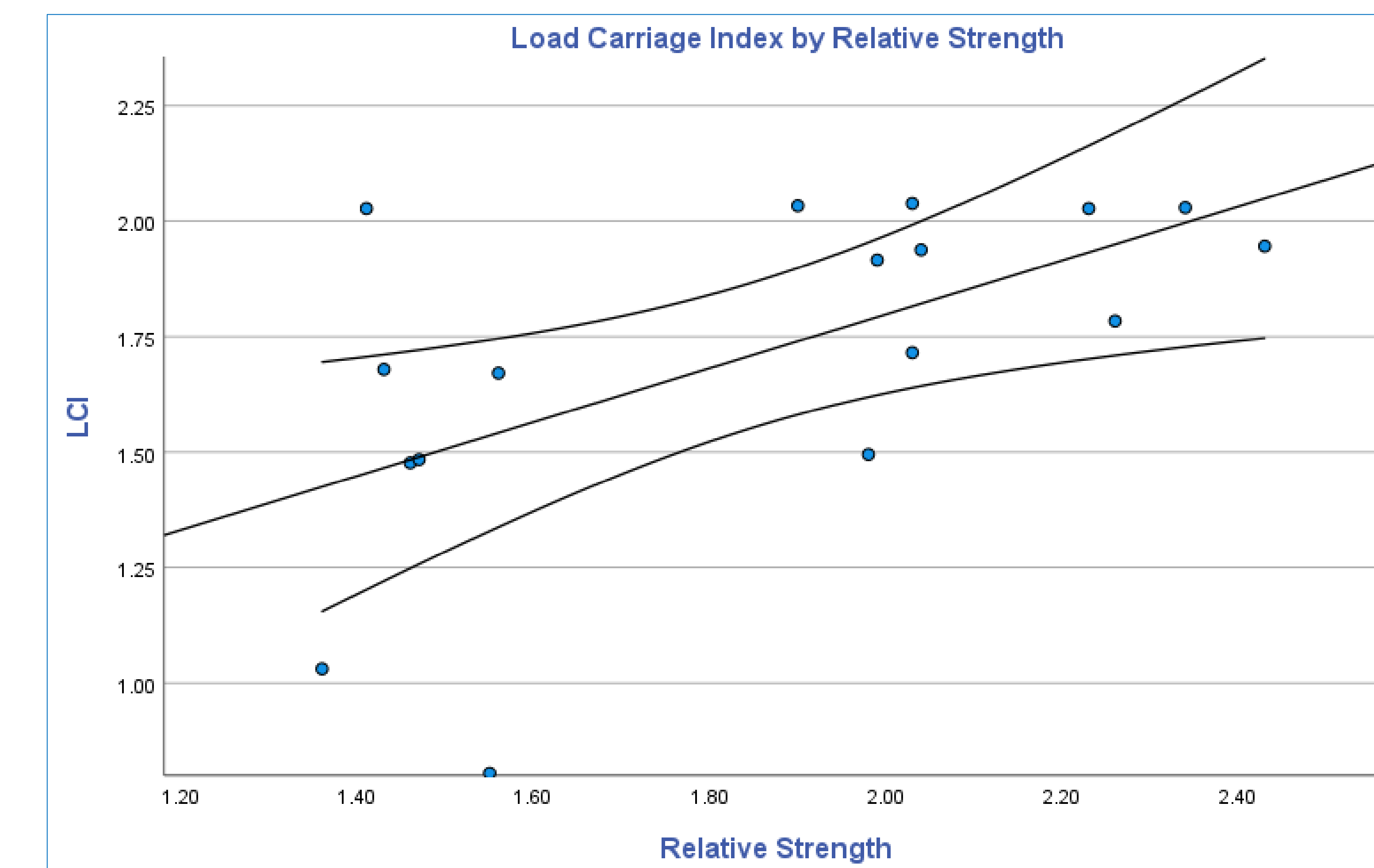
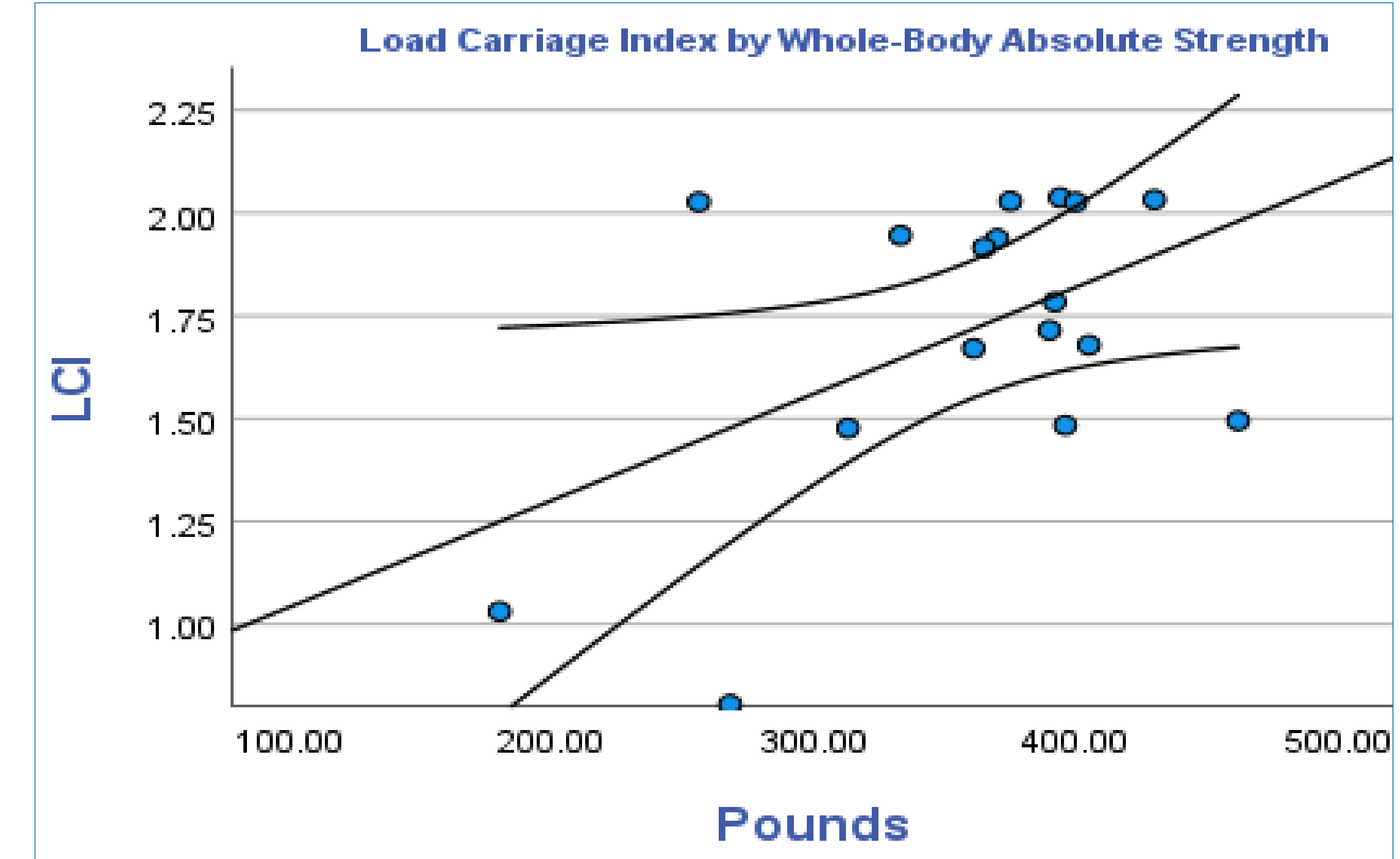
Acknowledgements

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Data Analyses



Conclusions

Career firefighters who possess higher amounts of whole-body absolute and relative strength have higher values on the LCI. Their ability to manage a load is not only dependent on their DM, but also higher amounts of lean mass in the form of skeletal muscle. Load carriage management can be improved by increases in muscle force production and decrease in fat mass.