



ASSOCIATION OF LOAD CARRIAGE INDEX TO FIRE SUPPRESSION ACTIVITIES

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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 that may impact duty. 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 dead mass. Physical abilities tests are often used to determine physical readiness of firefighters and consist of a battery of simulated fire-suppression activities (sFSA). Employing the use of the LCI when assigning firefighter loads may result in more effective performance of sFSA such as the hose drag, rescue, ladder raise, and forcible entry drills.

Purpose

This study was conducted to determine possible associations between the load carriage index (LCI) and fire suppression activities (FSA) in career male firefighters.

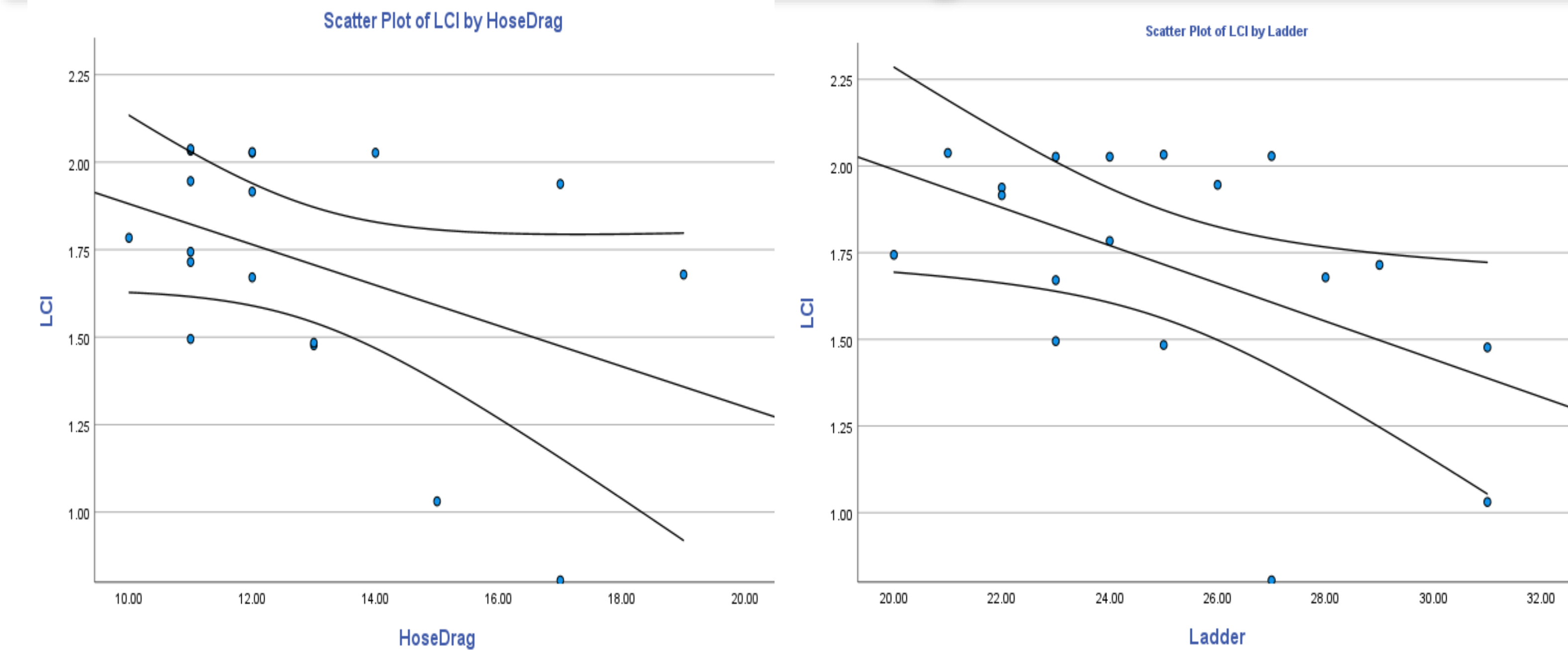
Methods

Male career firefighters (n=18, 35+/-8 yrs) completed a body composition assessment (20.01±8.13) followed by a series of four sFSA consisting of hose drag, rescue, ladder raise, and forcible entry. The sFSA were completed with a 49lb weighted vest in a continuous circuit with rest allowed only while walking to the subsequent task. Time in seconds for the hose drag (12.88±2.54), rescue (15.66±2.89), ladder raise (25.05±3.24), and forcible entry (3.05±1.11) was collected. Bivariate correlations were used to determine the association of the LCI (1.71±.351) with time from each of the four sFSA. Alpha level was set a priori at .05.

Simulated Fire Suppression Activities



Data Analyses



BF% (19.7±8)	Mass (88.8±17.9)	Fat Mass (17.9±8.8)	Lean Mass (70.8±12.9)	Fat Mass with Load (42.4±8.8)	Load Carriage Index (1.7±0.3)
17.0	102.8	17.5	85.3	42.0	2.0
25.4	97.6	24.8	72.8	49.3	1.5
16.0	78.8	12.6	66.2	37.1	1.8
25.1	104.7	26.3	78.4	50.8	1.5
25.4	128.7	32.7	96.0	57.2	1.7
19.1	87.3	16.7	70.6	41.2	1.7
16.5	78.1	12.9	65.2	37.4	1.7
28.5	60.0	17.1	42.9	41.6	1.0
41.5	78.6	32.6	46.0	57.1	0.8
14.3	88.3	12.6	75.6	37.1	2.0
22.9	105.4	24.1	81.2	48.6	1.7
13.2	82.7	10.9	71.8	35.4	2.0
14.4	82.3	11.8	70.4	36.3	1.9
12.9	81.5	10.5	70.9	35.0	2.0
28.3	122.4	34.6	87.7	59.1	1.5
15.0	83.5	12.5	70.9	37.0	1.9
8.0	62.4	5.0	57.4	29.5	1.9
10.5	72.9	7.7	65.3	32.2	2.0

Load Carriage Index

The load carriage Index:

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

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



Results

Of the four sFSA, only the hose drag (r = - .519; p = .043) and the ladder raise (r= -.504; p = .033) demonstrated a significant negative association with the LCI.

Acknowledgements

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Conclusions

The hose drag and ladder raise were the only two sFSA assessed in which the candidate had to manage the inclusion of an external load (hose and ladder). Firefighters with lower amounts of fat mass (higher LCI) performed better on sFSA with additional external loads. The significant relationship between LCI and the two fire sFSA indicate the LCI may be used as a tool for assigning loads to be carried while considering the additional DM.