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Dennien, Brad; Mikhail, Monica; Orr, Rob Marc; Schram, Ben; Dawes, Jay

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Predicting Load Carriage Performance: A Critical Review

BRAD DENNIEN¹, MONICA MIKHAIL¹, ROBIN ORR ^{#2}, BEN SCHRAM^{#2} AND JAY DAWES^{#3}

¹Bond Institute of Health & Sport, Bond University, Gold Coast, QLD, Australia 4226

²Tactical Research Unit, Bond University, Gold Coast, QLD, Australia 4226

³University of Colorado – Colorado Springs, Colorado Springs, CO, USA 80918

Abstract:

Purpose: In recreational and occupational pursuits, as well as completing daily task, humans may be required to carry external loads on their bodies. The ability to safely carry these loads during everyday activities is vital for optimal performance to be achieved and to minimize the potential for injury. The aims of this critical review were to identify studies reporting on formulas that predict load carriage, performance, critically appraise them and synthesize their findings. **Methods:** A search of key databases (ProQuest, Cinahl/Sports Discus, PubMed/Medline) was completed with identified studies subjected to inclusion and exclusion criteria. Included studies were critically appraised by two authors independently utilizing the Downs and Black checklist. Pertinent data were then extracted, synthesized and tabulated. **Results:** Ten studies met the review criteria and ranged in critical appraisal scores from 38% to 77% with a mean score of $56 \pm 0.25\%$. A good interrater agreement ($k= 0.720$) existing between raters. Various loading conditions, velocities, terrains, gradients and predictive equations were utilized across the studies and all studies recorded anthropomorphic data of the participants. Of the ten studies, six had only male participants, two had an even split between male and female participants and two studies included one female with the other participants being male. Military populations consisted of four studies, one study utilized university participants and the remaining five studies were conducted on the general public or the population was not reported. Eight studies were conducted within the USA while one in both Israel and one Belgium respectively. **Conclusion:** Of the 10 critically appraised articles in this critical review, it is evident that there lacks a clear and concise equation that can be used as a predictive measure to be able to accurately predict load carriage and its relation to performance and injury across varying conditions. Considering the wide-ranging requirements and contexts in which loads are carried, the potential for injuries and the potential negative impacts on recreational activities, occupational demands and daily life requirements, further research into a means of accurately predicting the costs of load carriage tasks on the human system may be of benefit.