

The Effects of Rifle Carriage on Ground Reaction Force Parameters

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ABSTRACT

Injury rates among military personnel are of great interest to all involved, from regiment commanders to political decision makers all the way down to the lowest ranked soldier. Data from 1st Gulf War suggested that musculoskeletal injuries accounted for 39% of all hospital admissions, compared to only 5% that were battle related (Songer and LaPorte, 2000). This highlights the need to find effective ways to reduce or manage these injury risks. Rifle carriage is obviously essential, but it's effects on basal gait patterns and therefore potential for injury has received little attention.

*Rifle carriage has two effects; restricting natural arm swing patterns and shifting the body's centre of mass anteriorly. Kinetic data were collected from 15 male participants who completed 4 conditions: **Boot** – Participants wore standard issue UK military leather boots. **Fixed Arms** – A lightweight, rifle shaped simulator was carried, this added no mass but restricted arm movements. **Fixed Mass** – Equivalent mass of the rifle was placed at the same location as when the actual rifle was carried, with no arm restrictions. **Rifle** – A weighted replica SA80 rifle was carried. Ten successful trials were collected for each condition; data was sampled at 400 Hz. Walking speed was fixed at 1.5 m.s⁻¹ (± 5%).*

Results showed that rifle carriage significantly increased the impact peak, maximum propulsive force and mediolateral impulse, while decreasing the force minimum compared to the boot condition. The majority of these affects are due to the restriction in natural arm movements caused by rifle carriage. The impact of these findings on the contribution to military injury knowledge is that increased impact forces have been linked to overuse injuries in the lower limb (Cavanagh and LaFortune, 1980). Decreased force minimum is related to greater knee joint range of motion, and increased mediolateral impulse may indicate a decrease in stability.

REFERENCES

- Songer, T. J. and R. E. LaPorte (2000). "Disabilities due to injury in the military." American Journal of Preventive Medicine **18**(3, Supplement 1): 33-40.
- Cavanagh, P. and M. A. LaFortune (1980). "Ground reaction forces in distance running." Journal of Biomechanics **13**: 397-406.