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## Self-Reported Load Carriage Conditioning Practices of Australian Soldiers

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## “Integrating the Future Land Force”

**DSTO** Science and Technology for Safeguarding Australia

### EXTENDED ABSTRACT1 SUBMISSION

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# Self-Reported Load Carriage Conditioning Practices of Australian Soldiers

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**Abstract**—Soldiers are required to carry external loads as part of their occupation. Physical conditioning to carry such loads is vital if injuries are to be avoided and occupational task performance optimised. Soldiers were asked to describe their most recent load carriage physical training session via an online survey. Of the 338 respondents, only 41% reported completing a load carriage conditioning session in the preceding 14 days. The loads carried ranged from a mean Patrol Order load of 15.5 kg ( $\pm 10.8$  kg) to a mean Marching Order load of 36.3 kg ( $\pm 12.0$  kg). Roads (42%) and dirt or grass (39%) constituted the predominant terrains traversed, with the majority of sessions (79%) lasting no more than 2 hours and being of an endurance marching nature (60%). When compared to the recommended load carriage conditioning requirements suggested by the literature, these conditioning sessions were deficient in several areas when relating to the Frequency, Intensity, Time and Type of conditioning required. These results suggest that soldiers may not be optimally conditioned for field and operational load carriage requirements.

**Keywords**—Load carriage, soldier, physical conditioning

## I. INTRODUCTION

The need to condition soldiers to carry loads is not new and can be traced back as far as the Roman Legionnaires [1]. If physical conditioning is to provide a means of mitigating load carriage risk, the physical training (PT) conducted by soldiers must prepare them for the contexts in which the loads will be carried during field training exercises and on military operations. An insufficient training dose could fail to condition the soldiers to the standard required to withstand occupational load carriage demands [2]. This in turn could leave them susceptible to injury and impaired performance through insufficient conditioning preparations. Alternatively, if the load carriage training stimulus is excessive, the susceptibility to injury, particularly overuse injury, increases [3]. Thus, to avoid becoming a risk source and to be effectively employed as a risk treatment, load carriage conditioning must follow established best training practice. The aim of this paper was to investigate Australian Regular Army (ARA) load carriage conditioning practices and to evaluate these practices against evidence based best practice.

## II. METHOD

### A. Participants

Units, selected via purposive sampling, were invited to engage in the study. All personnel posted to the selected units at the time of this study were invited. Of the 338 respondents, 22 (7%) were females ranging in age from 20 to 46 years ( $M=31.6 \pm 8.0$  years), in height from 1.53 to 1.76 m ( $M=1.66 \pm 0.78$  m), and in body weight from 52 to 80 kg ( $M=66.8 \pm 7.7$  kg). The male respondents (93%,  $n=316$ ) ranged in age from 18 to 56 years ( $M=31.5 \pm 7.6$  years), in height from 1.50 to 2.00 m ( $M=1.80 \pm 0.73$  m) and in body weight from 60 to 126 kg ( $M=85.5 \pm 11.1$  kg).

### B. Data collection

Survey responses were collected via an online survey employed to capture information directly from the target population [4], in this instance ARA soldiers serving in various locations across Australia and overseas. The survey, which was part of a larger investigation into ARA load carriage practices, was designed in accordance with evidence-based recommendations [5]. This study reports the findings from questions relating to load carriage training (Questions 13-16) as they relate to the demographic data gathered in (Questions 1 and 2) with internal checks to confirm responses drawn from questions on most recent load carriage activities (Questions 4 and 5).

### C. Data extraction and analysis

Data were extracted from the online survey and described in terms of the Frequency, Intensity, Time and Type (F.I.T.T.) principle, a method commonly employed to describe PT training dose [6].

### D. Authorisation and Ethics

The research was sponsored by Joint Health Command. Support for the research was provided by Forces Command. Ethics approval for the research was granted by the Australian Defence Human Research Ethics Committee, and the Behavioural and Social Sciences Research Ethics Committee of The University of Queensland.

### III. RESULTS

When asked to describe their most recent load carriage PT session, 41% (n=126) of respondents reported participating in a session in the preceding fortnight. Conversely, over 19% (n=59) reported having not participated in a load carriage session within the last 3 months (91+ days).

Respondents reported wearing a mean Patrol Order (PO) load of 15.5 kg ( $\pm 10.8$  kg) or 18% body weight ( $\pm 12\%$  BW) or mean Marching Order (MO) load of 36.3 kg ( $\pm 12.0$  kg) or 43% body weight ( $\pm 14\%$  BW). MO was the most commonly reported form of dress for the load carriage PT sessions (69%).

During load carriage PT sessions performed while wearing PO, just over 10% of respondents reported wearing body armour and 26% reported carrying additional stores. Among the respondents wearing MO, only 5% wore body armour, although considerably more (40% of respondents) carried stores compared to those wearing PO (26% of respondents).

Respondents reported covering a variety of different terrains during their most recently conducted load carriage PT session. Roads (42%) and dirt or grass (39%) constituted the predominant terrains traversed, with light bush (16%) making up the majority of the remaining terrain types. Well over 90% of all recent load carriage PT sessions (Endurance Marching, Lift and Carry, etc.) were conducted on terrain that was either flat or characterised by mild hills.

The majority of respondents' PT sessions (79%) lasted for no more than two hours, although sessions lasting up to three or more hours were reported (5%). For PT sessions lasting up to 6 hours, Endurance Marching was the most common activity (68%), followed by PT sessions combining several activities (19%). Among the 79% of PT activities which lasted for 2 hours or less, 49% lasted no more than 60 minutes.

Endurance Marching was the most common load carriage training activity (60% of nominated activities) with the majority of these sessions (88%) conducted in MO. Few respondents reported wearing body armour (4%) or carrying stores (16%) during these PT sessions. Lift and Carry PT sessions involved the highest number of respondents (71%) carrying stores. Only 10% wore body armour and the majority of the Lift and Carry sessions were conducted in PO (94%).

### IV. DISCUSSION

In comparing the results of this study to best practice [7, 8], the Frequency, Intensity, Time and Type (F.I.T.T.) principle was used. Research on load carriage conditioning suggests that the optimal training frequency is one session every seven to fourteen days [7, 8],

When considering the frequency of training, only 42% of survey respondents claimed to have participated in a load carriage PT session within the preceding fortnight. Apart from an increased potential for these soldiers to sustain a future injury when required to again conduct a load carriage activity [9], soldiers may lose a measure of specific load carriage fitness through non-use [6].

In the load carriage context, intensity is influenced by weight of load, speed of movement, and terrain being traversed

[10]. For best practice, a progression in load carriage intensity to meet with occupational demands is considered optimal (Leslie, 2007). The loads reported to have been carried by respondents (mean PO = 15.5 kg  $\pm 10.8$  kg: mean MO = 36.3 kg  $\pm 12.0$  kg) during their PT were notably lower than the loads reportedly carried during field exercises (mean PO = 24 kg: mean MO = 47 kg) or on operations (mean PO = 50 kg: mean MO = 62.5 kg) [11].

Best practice for the length (time) of load carriage PT conditioning sessions was considered to be a period meeting occupational demands [12]. With the majority of load carriage PT sessions reportedly under two hours, these sessions failed to meet the durations typical of load carriage activities in field training exercises and military operations [11].

The optimal type of training needed for load carriage conditioning requires specific load carriage PT to be conducted, that is, load carriage marching [7, 10]. While Endurance Marching was the most commonly reported PT session for load carriage, the nature of these sessions (clothing and equipment, terrain, etc.) did not meet with occupational requirements.

### V. CONCLUSION

The load carriage PT practices of ARA soldiers achieved limited success in meeting established evidence-based guidelines for load carriage conditioning when considered against the F.I.T.T. principle. Deficiencies were found across all four components. These results suggest that ARA soldiers are not being sufficiently conditioned for field and operational load carriage.

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