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Tactical Load Carriage: Impacts and Conditioning

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**SPORTS
SCIENCE**

24th - 26th JANUARY

2017



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TACTICAL RESEARCH UNIT

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Bond University

*Tactical Load Carriage:
Impacts and Conditioning*



CONTENT:

- Load carriage context
- Risks associated with load carriage
- Risk variables
- Load carriage conditioning



MILITARY CONTEXT



http://img266.imageshack.us/img266/9808/digger_ssmg28.jpg



http://4.bp.blogspot.com/_BZQXUhgZR3A/S9Tzq_w6uOI/AAAAAAAAABE/HGGoRbjiaoU/s1600/vietnam-peter-b.jpg



http://upload.wikimedia.org/wikipedia/commons/5/5a/Australian_soldier_Afghanistan_Aug_2008.jpg



FIREFIGHTER CONTEXT

1770



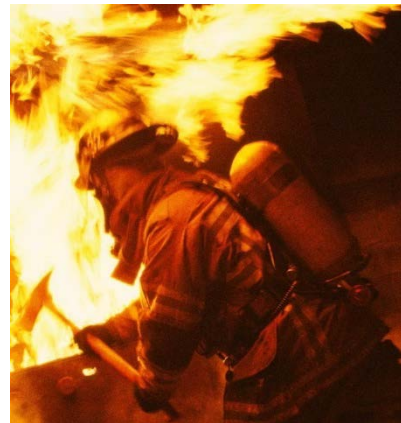
http://upload.wikimedia.org/wikipedia/commons/thumb/6/66/Old_firefighters.jpg/220px-Old_firefighters.jpg

1879



http://upload.wikimedia.org/wikipedia/commons/4/43/Vintage_firefighters.jpg

2012



<http://www.stacksplace.com/EMS/ffadd1.jpg>



LAW ENFORCEMENT CONTEXT

1890s



[http://2.bp.blogspot.com/-xHtSiLRFIMQ/UfewLRnEgAI/AAAAAAAAApc/54yapn_iBtE/s1600/Curious+Black+&+White+Photographs+of+The+Police+Officers+from+1890-1930+\(28\).jpg](http://2.bp.blogspot.com/-xHtSiLRFIMQ/UfewLRnEgAI/AAAAAAAAApc/54yapn_iBtE/s1600/Curious+Black+&+White+Photographs+of+The+Police+Officers+from+1890-1930+(28).jpg)

1970s



[http://3.bp.blogspot.com/-HO26ffMhqS4/UiHkEhycrol/AAAAAAAAAMR4/qGsg2ryfWKA/s640/Pictures+of+Life+of+the+New+York+Police+Department+in+the+1970's+\(7\).jpg](http://3.bp.blogspot.com/-HO26ffMhqS4/UiHkEhycrol/AAAAAAAAAMR4/qGsg2ryfWKA/s640/Pictures+of+Life+of+the+New+York+Police+Department+in+the+1970's+(7).jpg)

2010



<http://images.smh.com.au/2012/12/04/3861588/artist-police-uniforms-620x349.jpg>

<http://images.smh.com.au/2009/03/09/410908/policebelt.jpg>

http://www.gunblast.com/images/WBell_PoliceHolsterHistory/Police-Holster-History-012.jpg





SEARCH AND RESCUE (SAR) CONTEXT



<http://bloximages.newyork1.vip.townnews.com/estesparknews.com/content/tncms/assets/v3/editorial/d/c7/dc7f6316-1ea7-11e5-a8eb-bb1f7936f02e/5591bc1ee90b6.image.jpg>



<http://www.medicinac.si/wp-content/uploads/2013/10/img51351803309img5092e1ada9b3c.jpg>



<http://www.sandia.gov/news-center/news-releases/2004/images/SAR-map.gif>



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RECREATIONAL / OCCUPATIONAL CONTEXT





RISKS ASSOCIATED WITH LOAD CARRIAGE

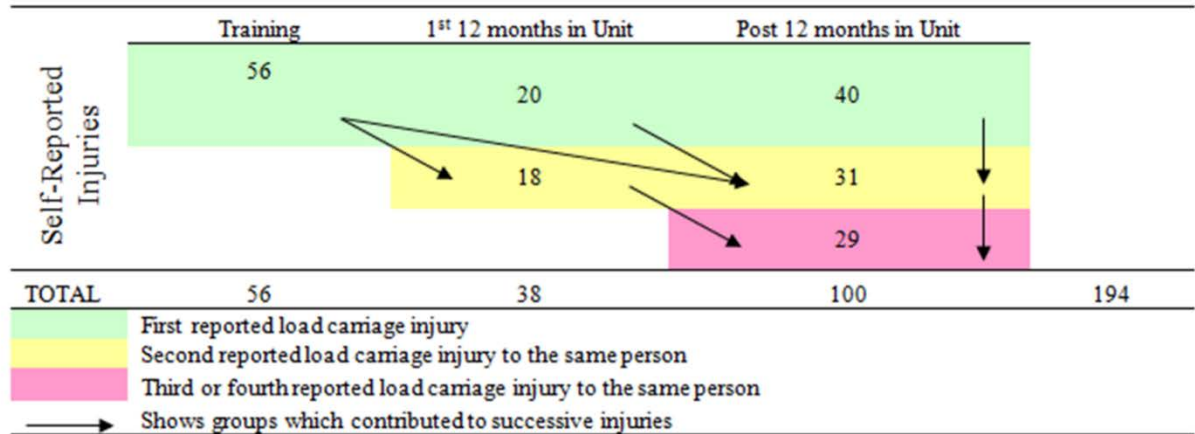
- Injuries: Associated with a variety of injuries (from skin blistering to muscle, ligament, tendon, bone and nervous system injuries)





RISKS ASSOCIATED WITH LOAD CARRIAGE

- Once injured – more likely to be reinjured



Orr, R., Pope, R., Coyle, J. & Johnston, V. (2016). Self-reported load carriage injuries in Australian Regular Army soldiers, *International Journal of Injury Control and Safety Promotion*, pp. 1-9 <http://dx.doi.org/10.1080/17457300.2015.1132731>



RISKS ASSOCIATED WITH LOAD CARRIAGE

- Decrements in performance:
 - ↓ Mobility
 - Increased risk of trip and fall
 - Decreased ability to negotiate escape routes



http://mountainenterprise.com/fds/images/story/fs_4764.jpg



<http://us-news.us/wp-content/uploads/2015/09/wpid-635780139405791932-Flash-Flood-114.jpg>





RISKS ASSOCIATED WITH LOAD CARRIAGE

- Decrements in performance:
 - ↓ Lethality
 - Marksmanship





RISKS ASSOCIATED WITH LOAD CARRIAGE

- Decrements in performance:
 - ↓ Attention to task: response to stimuli





RISKS VARIABLES

- \uparrow in load weight = \uparrow in the energy cost of standing, walking (forwards and backwards, up and down stairs) and running
- \uparrow in speed of load carriage = \uparrow in the energy cost of carrying given load (more than weight)?
 $\uparrow 0.5\text{km/h} = \uparrow 10\text{kg}$



1 Joint Public Affairs Unit - Achieves



http://i.dailymail.co.uk/i/pix/2009/06/09/article-0-0547F168000005DC-683_634x619.jpg



RISKS VARIABLES

- \uparrow in gradient of load carriage = \uparrow in the energy cost of carrying given load (more than weight)?
 $\uparrow 1\% = \uparrow 10\text{kg}$



1 Joint Public Affairs Unit - Achieves



http://mountainenterprise.com/fds/images/story/fs_4764.jpg



RISKS VARIABLES

- Different terrains types will elicit different energy cost requirements
(*road-light brush-heavy brush-sand*)



<http://crowboroughlife.com/wp-content/uploads/2015/02/Search-and-Rescue.jpg>





LOAD CARRIAGE CONDITIONING

- Concept is not new (*Flavius Vegetius Renatus - Epitoma rei militaris*)





LOAD CARRIAGE CONDITIONING

Research by Orr et al. (2010) and Knapik et al., (2012) recommend:

- F.I.T.T Formula (Frequency, Intensity, Time & Type)
 - F. 7-10 days per load carriage session
 - I. To loads required at the speeds and over the terrains required
 - T. Duration of load carriage operations
 - T. Load carriage preferable, but combined resistance and cardio may be of some benefit



LOAD CARRIAGE CONDITIONING

- Specificity



<http://www.grough.co.uk/lib/img/editorial/KirkbystephenCautley-Spout-2.jpg>



<http://blog.nhstateparks.org/wp-content/uploads/2012/04/Search-Rescue-litter-passing-over-rough-terrain.jpg>



Take Home Messages

- Load carriage reduces performance and can cause injuries = decreased operational success
- Load carriage is about more than the load weight, terrain type and grade, speed of movement and load position must be taken into account
- To minimise the risk of injury and increase the potential for operational success personnel need to be conditioning to carry load and effectively reconditioned following an injury



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