



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Lumbar load in common work tasks for baggage handlers

Koblauch, H.; Bern, S. H.; Brauer, C.; Mikkelsen, S.; Thomsen, J. F.; de Zee, Mark; Thygesen, L. C.; Helweg-Larsen, K.; Alkjær, T.; Simonsen, E. B.

Published in:

Proceedings, 4th Annual Meeting of the Danish Society of Biomechanics, 26 October 2012, Aarhus, Denmark

Publication date:

2012

Document Version

Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Koblauch, H., Bern, S. H., Brauer, C., Mikkelsen, S., Thomsen, J. F., de Zee, M., Thygesen, L. C., Helweg-Larsen, K., Alkjær, T., & Simonsen, E. B. (2012). Lumbar load in common work tasks for baggage handlers. In *Proceedings, 4th Annual Meeting of the Danish Society of Biomechanics, 26 October 2012, Aarhus, Denmark* (pp. 5). Aarhus University.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- ? Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- ? You may not further distribute the material or use it for any profit-making activity or commercial gain
- ? You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

Lumbar load in common work tasks for baggage handlers

H. Koblauch¹, S.H. Bern², C. Brauer², S. Mikkelsen², J.F. Thomsen², M. de Zee³, L.C. Thygesen⁴, K. Helweg-Larsen⁴, T. Alkjær¹, E.B. Simonsen¹

¹Dept. of Neuroscience and Pharmacology, University of Copenhagen; ²Dept. of Occupational and Environmental Medicine, Bispebjerg University Hospital; ³Dept. of Mechanical and Manufacturing Engineering, Aalborg University; ⁴National Institute of Public Health, University of Southern Denmark

Introduction: Baggage handlers have a history of frequent occupational injuries. The lumbar spine is often the site of these injuries. The baggage-handlers often work in constrained spaces, yielding sitting, kneeling or stooping positions. These positions have been associated with low back pain. The purpose of the study was to investigate the biomechanical loading of the lumbar spine during common working tasks for baggage handlers.

Methods: We selected ten different but common working tasks. The tasks were: 1) loading without belt-loader, 2) loading and 3) unloading with belt-loader, 4) sitting, 5) kneeling, and 6) stooped work position, 7) loading and 8) unloading baggage-containers, and 9) pulling and 10) pushing baggage/container carts. In each task 10 different baggage-handlers were filmed. Segment-angles were measured on still-pictures using ImageJ (National Institute of Health, USA) and used as input to the software-program Watbak (University of Waterloo, Canada) which calculated the compression force of the L4/L5-segment. A linear mixed model with Tukey-adjusted post-hoc multiple comparisons was applied to determine significant differences between tasks. Significance was accepted at $p < 0.05$.

Results: The average compression was largest in the stooped task (3,893 N) (Figure 1), while kneeling (2,631 N) work showed the second largest compression. Third and fourth largest compressions were in loading (2,582 N) and unloading (2,522 N) baggage-containers. The lowest compressions were in pulling (1,388 N) and pushing (1637 N) carts and loading aircrafts without belt-loader (1,572 N). The compression in the stooped task was significantly larger than all other tasks. Loading and unloading containers and kneeling posture were significantly lower than stooping, but significantly larger than the remaining tasks (Table 1).

COMPRESSION		TASK										
TASK	mean	LNA	LBE	UBE	STO	KNE	SIT	PULL	PUSH	UCO	LCO	
LNA	1572.51	x										
LBE	1933.23		x									
UBE	2016.04			x								
STO	3893.52				x							
KNE	2631.08					x						
SIT	1783.81						x					
PULL	1388.89							x				
PUSH	1637.52								x			
UCO	2522.10									x		
LCO	2582.71										x	

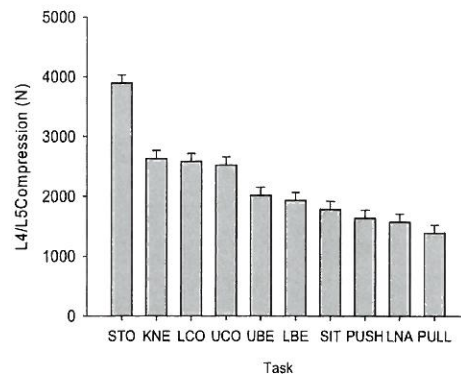


Table 1. Differences between tasks. Green areas represent significant differences between tasks.

Figure 1. L4/L5 compressions. Error bars are SEM. STO=stooped, KNE=kneeling, LCO=load container, UCO=unload container, UBE=unload belt, LBE=load belt, SIT=sitting, PUSH=push carts, LNA=loading without belt, PULL=pull carts.

Discussion: Only the compression force in the stooped task exceeded the limit of 3.4 kN, which has been suggested by The National Institute for Occupational Safety and Health (NIOSH). The NIOSH equations, however, do not take restricted workspace, working position as seated or kneeling or one-handed lifting into account. The seated position produced a significantly reduced compression compared to the kneeling position. Thus this position may be recommended instead of kneeling when loading baggage inside an aircraft.