

AN ELECTROMYOGRAPHICAL ANALYSIS OF UNASSISTED ANTERIOR AND POSTERIOR LOAD CARRIAGE

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Figure 1. Posterior Carriage Assistive Device being field tested.

Introduction: During an ergonomic analysis of professional movers, it was found that many experienced movers carried loads on their back without the use of assistive devices. There is an absence of literature that investigates the effects of posterior load carriage without the use of assistive devices. The purpose of this paper is to use electromyographic analysis to compare posterior load carriage to traditional anterior load carriage and determine if differences in muscular activity exist.

Methods: Ten male participants (age 19-36 years) with no professional moving experience were recruited to perform a simulated carrying task. Their skin surfaces were prepared and surface electrodes were unilaterally applied to 8 muscle sites. They used a box loaded to 20% of their body weight. The subjects carried the load for 30 seconds with EMG data being collected in the last 10 seconds. A repeated measures ANOVA was performed to test for significant differences between the anterior and posterior load carriage methods' EMG averages.

Results: The posterior carriage method showed a significant reduction in the thoracic erector spinae (TES) and lumbar erector spinae (LES) muscle activity at the 10th, 50th and 90th percentiles while concomitantly increasing the posterior deltoid (PD) activity. All other muscle groups showed similar means with no statistical differences. Table 1 displays data for the muscle groups with statistically different means.

	PD (%MVC)		TES (%MVC)		LES (%MVC)	
	AC	PC	AC	PC	AC	PC
10 th ile	0.4	1.4	2.9	1.1	5.4	0.7
50 th ile	1.0	2.9	7.8	2.8	10.9	1.9
90 th ile	2.0	5.0	14.1	6.4	18.6	6.5

Table 1. A comparison of EMG means at the 10th, 50th and 90th percentiles.

p<0.10
p<0.05

Discussion: The posterior carriage method significantly reduces muscle activity in the erector spinae and thus may reduce compression on the lumbar vertebrae. This carrying posture may be a useful technique in reducing back strain in occupations involving manual material handling. Therefore Queen's University has designed assistive carrying devices to aid in the use of the posterior carriage method. These devices are currently being tested and are yielding significant results in muscle activity reduction. Furthermore, an anterior assistive device has been designed to assist individuals in carrying loads in front of them and has shown promise to dissipate forces away from the lumbar musculature.

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